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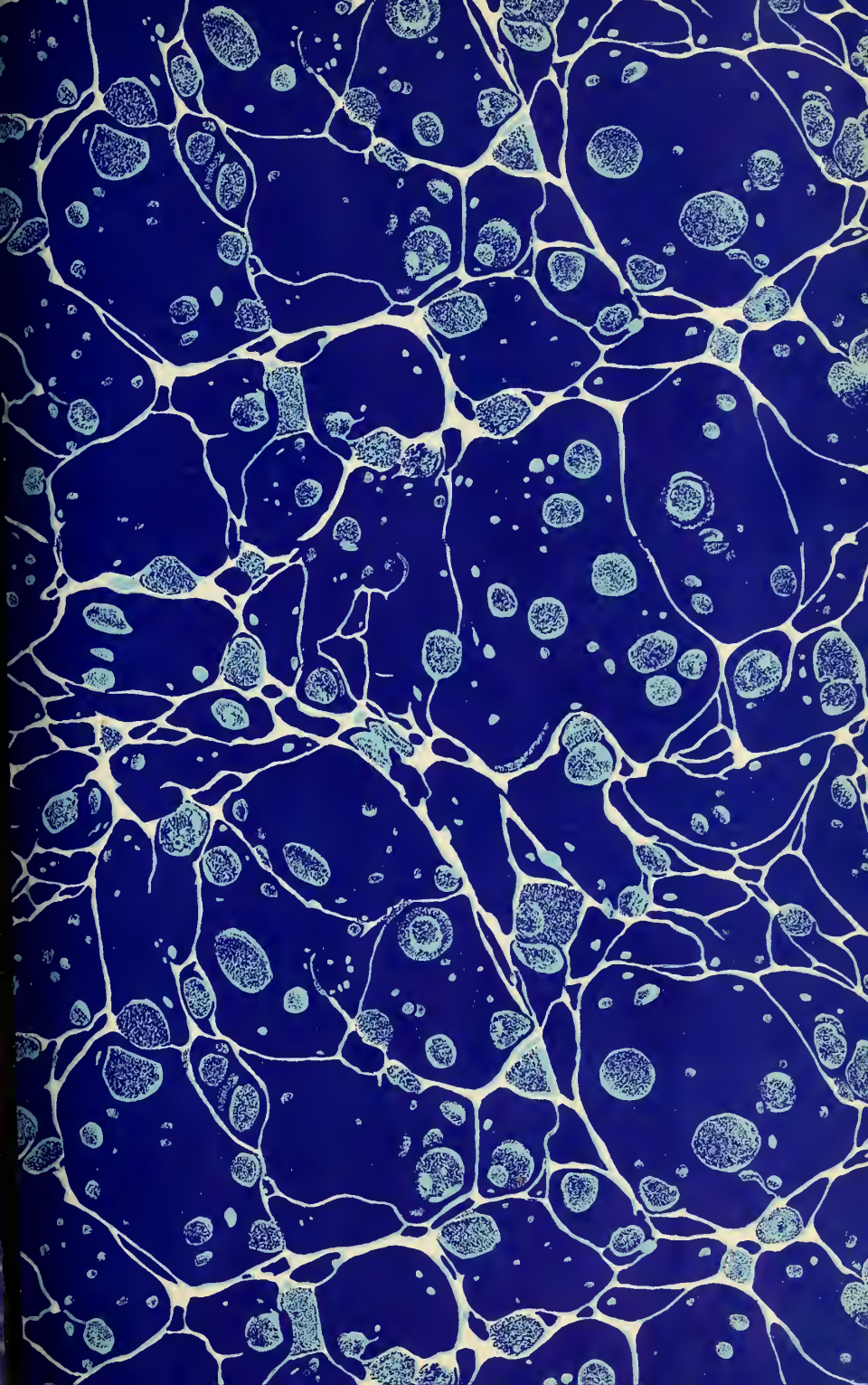
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U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
A. C. TRUE, DIRECTOR.

ANNUAL REPORT OF THE ALASKA AGRICULTURAL
EXPERIMENT STATIONS FOR 1901.

BY

C. C. GEORGESON,
Special Agent in Charge.

[Reprint from Annual Report of the Office of Experiment Stations for
the year ended June 30, 1901.]



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ANNUAL REPORT OF THE ALASKA AGRICULTURAL EXPERIMENT STATIONS FOR 1901.

By C. C. GEORGESON, *Special Agent in Charge.*

The leading features of the Alaska investigations during the year 1901 have been the further clearing and improving of land, the growing of experimental crops, the opening of the station at Rampart, on the Yukon, the distribution of seed, and a reconnoissance of the region between Eagle, on the Yukon, and Valdez, on Prince William Sound. We have, in addition, as heretofore, superintended the meteorological observations along the Alaska coast.

At Sitka but little more land has been cleared, but a good deal has been done toward the improvement of that already cleared. At the Kenai Station likewise additional land has been cleared, broken, and put in condition for culture, and at the Rampart Station as much land was cleared as one man could get in condition in time for spring planting.

The experimental croppings have been chiefly directed toward ascertaining what can best be grown in this climate, and how crops should be treated for the best results. By the distribution of small packages of seed grain to persons who seemed likely to undertake the work an effort has been made to have the common hardy cereals tested over as wide an area as possible. However, but very few reports from these volunteer experiments have been received at this writing. Garden seeds and some flower seeds have also been distributed to about 500 persons in the Territory, who either are or ought to be interested in the development of agriculture. The seed distributed is much appreciated for the reason that it is a difficult matter for settlers anywhere, except along the seacoast, to obtain seeds.

The examination of the interior from Eagle to Valdez, with a view to get information in regard to its agricultural possibilities, the writer regards as an important piece of work preliminary to the opening of one or more stations in that region. A detailed report on the subject is submitted herewith (p. 283).

The season has, on the whole, been unfavorable. Of the four years during which work has been in progress, this has been the worst. The spring and early summer were abnormally dry, which retarded the growth of crops, and the latter half of the summer and the entire fall have been abnormally wet, which prolonged the growth and made

it difficult to harvest the grain after it was grown. But in spite of these drawbacks the results may be justly said to be satisfactory, especially here at the headquarters station. We have matured rye, wheat, barley, oats, and buckwheat, and successfully grown all the leading hardy vegetables. At the Kenai and Rampart stations the experiments have also been successful in a large measure, and our knowledge of the agricultural possibilities of the Territory has been materially extended.

There are many things that it was planned to accomplish this year which have not been done for want of funds to work with. The headquarters building at Sitka has not been completed, as was planned. Only the lower story is in condition for use. The porch has not been built, no heating plant has been put in, and the foundation between the piers on which the house rests has not been built up. Nor has anything been done toward equipping a laboratory with apparatus for simple chemical and botanical work. Likewise nothing has been added in the line of implements, work animals, or other live stock, all of which must be supplied before it is possible to do creditable work along scientific lines.

On the other hand, three much-needed buildings have been put up, namely, a barn and a small cottage at the Sitka Station, and a log building at the Kenai Station, which is intended for the combined purposes of a dwelling for the superintendent and a storehouse for seed, grain, and other articles that should be well protected. None of these buildings has been entirely completed at this writing.

WORK AT SITKA STATION.

There are now 4 acres of new ground under culture at the Sitka Station, and 2 acres more have been cleared and thoroughly ditched preparatory to being underdrained. It should be noted, however, that while the ground is under culture it is not thoroughly subdued. It takes time and tillage to bring the new, raw land into a thoroughly satisfactory condition. Aside from the station land, I have had the use of three lots in the town of Sitka, which belong to the Russian Church, and which aggregate about an acre and a half in area.

EXPERIMENTAL CROPS.

The following varieties of grain were grown the past season. The leading characteristics of each are brought out in the notes on its habit and growth.

RYE.

Swedish winter.—One of the lots in town belonging to the Russian Church was seeded to wheat on October 3, 1900. The seeding was late, for the reason that the growing crops had first to be removed,

there being no other available land. It was sown in a poor, gravelly soil containing very little plant food, and it was therefore necessary to give it a dressing of fish guano at the rate of 300 pounds to the acre. Many varieties of wheat were sown, but not one of these survived the winter. The Swedish winter rye was the only kind that came through alive. Owing to the late seeding it did not make much growth in the fall; it was in rather weak condition in the spring and the early growth was slow. By June 15 it had reached the height of 22 inches, and was then beginning to head. By June 24 it was two-thirds headed. July 1 it was all headed out and beginning to bloom. July 18 it was 4 feet 9 inches high, and part of it still in bloom. August 1 the grain was all formed, and August 15 it was in the dough. September 15 it was ripe, and was harvested on September 17. As noted, the soil was poor and the yield was not heavy. The value of the experiment lies wholly in the fact that it was a winter grain and survived the winter uninjured.

Although the winters are not severe on the coast, they are, nevertheless, trying on winter grains when the snowfall happens to be light. Last winter there was not to exceed 1 foot of snow on the ground at any time, and it did not last more than two weeks at any time. The frequent thawing and freezing of the ground were the cause of winterkilling of the wheats above noted and not the cold weather.

WHEAT.

Romanow spring.—This is the only variety which was seeded this year. Of the several kinds which have been tested this has uniformly given the best results, and this point settled, it did not seem wise to continue an endless variety test. The wheat was originally imported from Russia by the United States Department of Agriculture in 1897. It is a brown bearded wheat with a red berry. The qualities which commend it for cultivation in Alaska are that it matures early, stands up well, and is a good yielder. Its milling qualities have not been tested. Three small plats were seeded to this wheat, two of them being on the lots in town, the third on new ground on the farm. The two plats in the town lots were seeded May 8 and the plat on the new ground on the farm May 11. All plats were up May 27. On June 15 it was 10 inches high on the old ground and only 5 inches high on the new ground. July 1 it was 22 inches high on the old ground and only 1 foot high on the new ground. The stand in both cases was fairly good. July 18 it was 2½ feet high on the old ground and three-quarters neaded; it was 20 inches high on the new ground and the heads just beginning to show. August 1 it was 3 feet high on the old ground and just passing out of bloom; on the new ground it was 34 inches high and still in full bloom. It should be

explained here that the old ground was gravelly soil, and therefore of the quality described as a "warm" soil, while the new ground was largely vegetable mold, containing much organic matter only partly decayed. The soil held moisture better during the dry season of the summer, but on the other hand it was not so warm. This explains the fact that the wheat on this ground was later in developing.

August 15 the wheat on the old ground was in the milk; on the new ground it was now 42 inches high and not entirely out of bloom. September 17 the wheat on the old ground was cut, but the wheat on the new ground was not harvested until October 3.

Almost continuous rain during the latter part of September and all of October rendered it difficult to cure this and all other grain. Advantage was taken of every rainless day to put the grain under shelter in the upper story of the barn where the wind has a clean sweep through, and by this means it was finally dried enough to thresh; but the wet weather discolored both the straw and the grain.

BARLEY.

Manshury.—A plat of this variety was seeded on new ground May 22. It was located on a little knoll which had been graded down in order to facilitate cultivation. This process exposed the subsoil, a red compact soil, apparently of volcanic origin. This red subsoil is absolutely sterile and it was therefore manured with barnyard manure, refuse silage, and a little fish guano, all three being mixed together and plowed under. The result was an excellent crop of barley. Seeded May 22 it came up June 7; was 3 inches high June 16; 1 foot high July 1; 2 feet 2 inches high July 18 and heading out; 3 feet high August 1 and in bloom. August 15 the grain was in the milk. On August 26 part of it was ripe and harvested. That portion which was not ripe grew in heavily manured spots, and the season of growth was therefore prolonged.

Sisolsk.—This variety was introduced by the Department of Agriculture from Russia. The seed here used was grown at the Sitka Station in 1900. A plat was seeded on new ground May 22. It was up June 7. June 15 it was 3 inches high. July 1 it was 8 inches high. The stand was very uneven owing to the quality of the new ground. July 18 it was 2 feet high and just beginning to head out. August 1 it was 32 inches high, fully headed and beginning to bloom. August 15 it had passed out of bloom and the grain was in the milk. September 4 it was ripe, but owing to continual rainy weather it was not harvested until September 24. As I remarked in last year's report, I consider this a promising variety. The straw is stiff and stands up well during storms. It is a six-rowed variety with large heads.

Manchuria.—A variety of barley obtained from the Minnesota Experiment Station. It resembles the Manshury so closely that it is difficult to distinguish one from the other. It was seeded May 22 on

new ground, on a plat located alongside of the two foregoing. On June 15 it was 3 inches high, with a good stand. July 1 it was 8 inches high, and owing to the new ground it was very good in spots and very poor in other places. July 18 it was 2 feet high and heading out and some heads in bloom. August 1 the best of it was 3 feet 6 inches high. August 15 it was 4 feet high and the grain in the milk. September 4 it was ripe and harvested. Certain spots, where the growth was excessive, were still green at this date. It is a promising variety for Alaska, and about equal to the Manshury in both earliness and productiveness.

Lapland.—The seed was imported under this name from Lapland by the United States Department of Agriculture. Seeded May 15, on new ground, it was up May 27. June 15 it was 4 inches high with a good stand and a good healthy color. July 1 it was a foot high and looked well on one-half the plat; the other half was stunted, owing to the character of the new ground. July 18 it was 28 inches high and nearly all headed out, beginning to bloom. August 1 the grain was formed. August 15 the grain was in the milk and August 26 it was ripe and harvested. This is the earliest variety of barley that we have found and it is apparently well suited to Alaska. The straw is short and the heads not large, but it stands up well and as here shown matures early. It is a so-called four-rowed variety.

Black Hulless.—A plat of this variety was seeded May 22 on new ground. It was up on June 7. On June 15 it showed a rather light stand and was 5 inches high. July 1 the growth was spotted, owing to the character of the new ground, the best of it 8 inches high. July 18 it was 20 inches high and a few heads showing. August 1 the best was 2 feet 6 inches high, beginning to bloom. August 15 it was 34 inches high and the grain forming. September 4 it was ripe, but owing to the continuous rain it was not harvested until September 23. This well-known variety is not a large yielder, but its earliness recommends it for use in Alaska. Moreover, the naked kernels make it possible for the Indians to use it in their primitive ways of cooking without being milled. For this reason I recommend that it be introduced in Indian communities. Our experiments have proved that it can be grown successfully in Alaska, and if the Indians were made familiar with its qualities, it ought to become popular among them as an addition to their very limited list of foods.

Chevalier.—The plat of this two-rowed variety was seeded on old ground in one of the town lots May 7. It was slow in coming up and made a poor growth all through the season. On June 15 it was only 3 inches high. July 1 it was 6 inches high. August 1 the best of it was 20 inches high. August 15 the best was 26 inches high and just beginning to bloom. This variety did not ripen. It can not be recommended for Alaska.

OATS.

Burt Extra Early.—One of the town lots was seeded to this variety May 9. The ground had been cultivated for years. It was up on May 18. On June 15 it was 3 inches high and the stand was excellent. July 1 it was 18 inches high and very promising. July 18 it was 30 inches high and almost entirely headed. August 1 it was 34 inches high and just past blooming. August 15 it was 3 feet high, the grain in the dough, and some of it beginning to ripen. It was ripe on August 26 and harvested on August 30. This is one of the most promising varieties of oats that we have tried. It has never failed to mature, and it can be recommended for all sections of Alaska, wherever grain can be grown. It is not a vigorous grower, nor does it yield as heavily as many of the later sorts. Its earliness is its chief recommendation.

North Finnish Black.—The station was supplied with about 2 bushels of seed of this variety. It was imported from Finland by the United States Department of Agriculture. Its origin would lead one to conclude that it would prove to be a very early variety. This, however, was not the case. It was seeded on new ground May 22. On June 7 it was up; on June 15, about 3 inches high, and the stand was excellent. July 1 it was 8 inches high, and the growth was spotted, good in places, poor in others, owing to the character of the new ground. July 18 it was about one-fourth headed and the best 2 feet high. August 1 it was 3 feet high and beginning to bloom; August 15, still in bloom, and the best of it had lodged. It does not seem to stand up well. Some of it was forming seed. Many of the plants continue to send out new shoots from the roots, so that it is in all stages of growth, some sprouts a few inches high, some of it heading, while the earliest is forming grain. September 10 there were many mature heads in the plat, but it was so uneven it could not be harvested. September 24 some of the ripest was cut, but the greater portion was still green. It should be noted that the ground is not well suited to variety tests. It was new and of uneven quality, but as far as results of this experiment would indicate, this variety has nothing to recommend it for Alaska above many other sorts of medium early oats.

FERTILIZER EXPERIMENTS WITH OATS.

With a view of testing the effectiveness of certain available fertilizers on new ground, six plats were laid out, each one-twentieth of an acre in extent, 1 rod wide by 8 rods long. The plats were treated as follows: Number one was fertilized with seaweed at the rate of 30 tons to the acre plowed under. Number two was fertilized with stable manure at the rate of 30 tons per acre. Number three was fertilized with fish guano from the Killisnoo factory at the rate of 500 pounds per acre. Number four was fertilized with 30 tons of seaweed plowed

under and 500 pounds of guano sown broadcast after plowing. Number five was fertilized with stable manure at the rate of 30 tons per acre plowed under and 500 pounds of fish guano per acre scattered broadcast after plowing. Number six was not fertilized. May 22 all of these plats were seeded broadcast with Finnish Black oats (the station does not own a grain drill). On June 7 all plats were up and showed no appreciable difference in color or growth. On June 15 there was a decided difference in the appearance of the plats. They ranked as follows in order from the best to the poorest: First, manure and guano; second, seaweed and guano; third, manure; fourth, seaweed; fifth, guano, and sixth, nothing. The manure and guano plat made the best showing. The growth was 4 inches high. From this the plats ranged down to an inch and a half. July 1 the several plats still ranked in the same order. The manure and guano plat has an excellent stand; the oats are very even and 10 inches high. The seaweed and guano plat is not quite so good; the stand is somewhat uneven and the growth 9 inches high. The same ratio holds good for the others, except the plat with no fertilizer. Here the crop is but 3 inches high and beginning to turn yellow.

July 18 the same rank was still maintained for the several plats. The plat fertilized with manure and guano was the best, the crop even and 2 feet high. The plat without any fertilizer was the poorest; the crop was uneven—in places entirely dead—and the best only 5 inches high. August 1 the same rank was still maintained. The height of the crop on the several plats was as follows: Manure and guano, 40 inches; seaweed and guano, 36 inches; manure (only), 30 inches; seaweed (only), 20 inches; guano (only), 20 inches. No fertilizer had by this time a very poor stand, and the best plants were only 12 inches high.

August 15 the fertilized plats ranked as before; all were in bloom, and the oats were lodging in spots. All the manured plats exhibited the characteristics noted in the description of the variety test referred to above, namely, that of sprouting from the roots. The storms which set in about this period beat the grain down. The earliest heads lodged and did not fill well. By September 10 some of it was ripe, but it would have been difficult to gather the ripe grain from the green suckers, and it was therefore left to be cut for hay. But almost incessant rain during September and October made it impossible to cure hay, and the plats were therefore not cut until November 1. When dry enough to be weighed the yield of hay for the several plats was at the following rates per acre: Plat fertilized with stable manure and guano yielded 1.67 tons; manured with seaweed and guano, 1.63 tons; fertilized with stable manure only, 0.8 ton; fertilized with seaweed only, 0.6 ton; with guano only, 0.6 ton, and with no fertilizer, nothing—only a few pounds.

The experiment simply proves in an emphatic way a fact which I have endeavored to point out in every report, namely, that new cleared and broken land is unproductive unless it is fertilized. It seems to lack available plant food, and it does not become productive until, by cultivation and exposure to the air, the inert plant food becomes available.

Prospectors and others who clear a piece of new ground and scatter a few seed are very generally disappointed in the result, and as a rule they blame the climate for their failure. The trouble lies in the fact here noted more than with the climate.

OATS AND PEAS.

All the new ground which was cropped for the first time this season was seeded to oats and peas. Fish guano at the rate of 300 pounds per acre was sown broadcast after the ground was plowed, and the grain was also broadcast. Oats and peas mixed were grown, partly because we have found that no other crop does as well on new, raw ground, and partly because the crop was needed for feed. The crop was uneven in stand and in growth, as it always is the first year or two on new ground, but on the whole it was quite satisfactory. The seed was not of selected varieties, but common oats and field peas, such as are offered for sale for feed. Seedings were made at several times from the first to the middle of June as the ground was gotten ready. We began cutting the crop for feed in the middle of September, and from that date until the 2d of November it was fed daily to the work oxen. The oats in the early seedings matured.

BUCKWHEAT.

Orenborg.—The station was supplied with a small quantity of seed which had been imported from Russia by the United States Department of Agriculture. A small plat was seeded May 22 on new ground. June 15 there was a good stand, but it had made but little growth, and the same applies to the condition July 1. On July 18 it was 12 inches high and blooming profusely. On August 1 the earliest blossoms had formed seed and it continued to bloom profusely. August 15 the first-formed grain began to harden. It was ripe September 5. This variety of buckwheat and also a so-called Finnish buckwheat, likewise imported by the United States Department of Agriculture, can be grown successfully in Alaska. But Japanese buckwheat and Silver Hull buckwheat, favored varieties in the States, have quite generally been failures at the Alaska stations.

FLAX.

Riga.—A small plat of new ground was seeded to flax of this variety in order to test the soil rather than the flax. The same variety was

grown at the station in 1899 on old ground with marked success. It then attained the height of 3 feet, produced a fiber of good quality, and matured seed; but on new ground it is not a success. The crop was stunted, the best not attaining 1 foot in height. This result was expected under the circumstances.

VEGETABLES.

Small plats were planted with the following kinds: Cabbage—Early Jersey Wakefield; cauliflower—Early Snow Ball, Extra Early Paris; kale—Scotch Curled; Brussels sprouts—Improved Dwarf; kohlrabi—Large White; peas—Earliest of All; beans—Broad Windsor, Golden Wax, Early Valentine; carrots—Half Long Scarlet; parsnips—Hollow Crown; beets—Early Egyptian; onions—Yellow Danvers; turnips—White Milan; garden cress; mustard—White London; celery—White Plume; celeriac.

These were grown in small plats, both on old ground and on new. On the old ground the results were highly satisfactory. I have never seen better kale, cabbage, Brussels sprouts, or cauliflower than were grown on a little corner of old ground at the base of Castle Hill. Some of the cauliflower heads measured 14 inches in diameter. The celery and celeriac were likewise good, and so were carrots, parsnips, and the other root crops.

On new ground, on the contrary, all these vegetables were but little short of failure, and had they been grown on new ground only, one might seemingly have been justified in stating that they could not be grown in Alaska. This is simply further proof of the oft-repeated fact that it requires some years to bring the soil into condition for satisfactory growth of crops of any kind.

I do not consider it necessary to carry out extensive experiments in the cultivation of vegetables. That all the common, hardy kinds can be grown to perfection in Alaska has been demonstrated so repeatedly in nearly every part of the Territory, in the interior as well as on the coast, that there is no further need of proof. The experiment stations should hereafter grow vegetables with a view to test the different methods of culture. The new ground at the Sitka Station is not yet in sufficiently good condition for that line of work.

For detailed results in the growth of vegetables elsewhere, I respectfully refer to the letters from people who have received seed from the experiment station, which are submitted herewith (pp. 316–336). For Sitka the letter from Mrs. George Stowell gives full details of crops grown in her garden the past season, and her experience is duplicated by dozens of others.

POTATOES.

Pride of North Dakota.—A corner of new ground, cropped for the first time this year, was planted to potatoes of this variety. None

were planted on old ground. The seed was grown at the station in 1900 and kept over winter in perfect condition. The first row was manured with seaweed at the rate of 30 tons per acre. The second was manured with fish guano, at the rate of 500 pounds per acre, and the third row was not fertilized. The fourth was manured with seaweed again, and so on through the whole patch. Although the crop was but light and can scarcely be called a success, the experiment is nevertheless of interest, because it shows that seaweed, so abundant everywhere along the coast, is an excellent fertilizer for potatoes. The guano, likewise, showed its effect, but not to the same degree. The rows which were not fertilized produced practically no potatoes. The ground was a vegetable mold which would ordinarily be considered rich, and with continued cultivation it will be productive in two or three years.

SMALL FRUITS.

Cuthbert raspberries.—Some plants were obtained from an old plantation, in Governor Brady's garden, and transplanted to a corner at the base of Castle Hill. The plants grew with great vigor and in spite of having been transplanted produced berries from the beginning of August until frost. The red raspberry is indigenous to Alaska, and flourishes in the coast region to perfection, and it can also be grown along the Yukon River.

Red currants.—I have obtained a few bushes by purchase and also procured cuttings from neighbors. These are doing well. It is the intention to use them for propagation if the proposed nursery is established. None of the station bushes has borne fruit, but vigorous bearing bushes can be found in nearly every garden in Sitka and other coast towns. The same may be said of the black currant.

Gooseberries.—Gooseberries are less common than currants, but they do well everywhere in the coast region. A few bushes have been procured with a view to use them for propagation.

NEW STATION BUILDINGS.

A NEW BARN.

The past year we have built a barn at the station 25 by 50 feet in dimensions and two stories high. The lower story is built of logs and the second story is frame. An illustration is submitted herewith. (Pl. VIII, fig. 1.) The logs were cut in the winter of 1899 and 1900, but there was not snow enough on the ground that winter to enable us to haul them out of the woods. During the past winter there was snow enough to haul them for only two weeks and the marshy ground over which we had to drive was not frozen solid for a much longer period, which proves incidentally that the winters are not severe at Sitka. The barn is not entirely completed at this writing, but the



FIG. 1.—ALASKA STATIONS—BARN AT SITKA.



FIG. 2.—ALASKA STATIONS—NEW COTTAGE, SITKA.

work on it is sufficiently advanced so that it is in use. The lower story is intended to be used for a stable, for the housing of implements, and a tool room for hand tools. The second story is designed to be used exclusively for the storing and handling of grain. To this end it is provided with a tight floor and, as may be seen in the illustration, there are large doors on both sides. These doors are intended to provide a free circulation of air, so the barn floor can be used as a place to dry grain in the protracted rainy season. It is a bank barn, with a driveway on the north side about 6 feet higher than the floor of the lower story. This facilitates the unloading of grain in the second story. It will be seen that it is connected with the silo, which is filled from the same driveway.

BUILDING A FARM COTTAGE.

Pl. VIII, fig. 2, illustrates a little two-story cottage which has been built on the farm in order to enable a man to live permanently on the place. The interests of the work require that there be constantly someone on the farm. The building is 30 by 14 feet, and when completed it will have two rooms and a kitchen below and two rooms above.

Both the barn and the cottage were built by Assistant Rader with such help as was hired on the farm. The financial outlay for these buildings amounts to little more than the price of the materials.

DRAINAGE.

In former reports attention was called to the necessity for thorough underdrainage of all low-lying ground, and also to the fact that portions of the cleared land had been underdrained with brush drains; that is, the ditches were filled with small brush, carefully packed in at an angle, and in such a way as to leave interstices through which the water can pass. These drains have given satisfaction so far. Their durability is the only doubtful point.

I believe we have discovered an improvement on the brush drain by the partial substitution of slabs for brush. Slabs are the first, or outside, cut of logs which are cut up for lumber in the sawmills. These slabs can be had very cheaply. They have been obtained in the past for 50 cents a load of about twenty-five pieces. When the bottom of the ditch is in firm ground, two slabs set on edge and leaned against each other in the form of an A will make a good conduit for the water. The two pieces are held securely together by a nail here and there where the two edges meet, and there will always be abundant openings for the water to get through. On top of this conduit are packed, first, poles, then coarse brush, and, finally, smaller brush, and on top of the brush, first sod and then earth. The materials cost but little for a drain of this kind; it is chiefly a matter of labor.

When the bottom of the ditch is soft, two slabs are put together in the shape of a V, in the middle of the ditch, and a third slab is nailed on top so as to leave a triangular water passage. On top of this are packed poles and brush as before. The writer believes that this kind of drain will last for many years. Slabs can usually be procured from sawmills everywhere, and as the mills multiply settlers can procure them in many instances near by their farms.

At the Sitka Station we are experimenting in this manner, with the drainage of about 2 acres of peaty soil. The object is to see what the productiveness of such a soil is when brought under culture. There are extensive areas of peat in Alaska, and it is important to know if such land has any agricultural value. In this instance it was found necessary to place the drains 15 feet apart. The work is not completed at this writing.

NATIVE GRASS FOR SILAGE.

I stated in my last report that the log silo which was built in the summer of 1900 had been filled with native grass. It gives me pleasure to report now that this experiment was a complete success. The silage kept well in this log structure and made a feed of good quality. Our oxen were fed on it almost exclusively during the past winter. They ate it readily and kept in fair condition. They were given a little grain in addition only when they were worked. On the top and around the sides there was a certain amount of decayed silage, but no more than is found in all cases when green forage is packed away. We found that this waste silage had some value for manure on certain plats of soil. The grass was cut on a natural meadow skirting a bay some distance from Sitka, where it grows in abundance. It was then loaded into a scow and the scow was hauled to the beach at the nearest point to the farm by our steam launch. The grass was $2\frac{1}{2}$ to 3 feet in length. It was thrown into the silo and tramped down at intervals during the process of filling. It settled into a very compact mass which was removed when wanted for feed by slicing it down with a hay knife.

During the latter part of August and the beginning of September of the present year the silo was again filled in the same manner, and as before it has resulted in a fine quality of feed. Not only will native grasses make good silage, but our log silo demonstrates the fact that it is not necessary for the farmer to go to great expense in building a silo. He can himself build one of logs. The logs should, however, be dressed on the inside and laid so as to make a nearly smooth wall. They should be fitted well upon one another and the openings between them should be chinked with moss, clay, or mortar in the usual manner.



FIG. 1.—ALASKA STATIONS—STATION BUILDING, KENAI.



FIG. 2.—ALASKA STATIONS—RECENTLY CLEARED LAND, KENAI.

WORK AT KENAI STATION.

On June 2 I left Sitka on the steamer *Newport*, for the westward, with a view to first visit the experiment station at Kenai on Cook Inlet, and then go to Unalaska, and from there to St. Michael and up the Yukon River in the interest of these investigations. The steamer *Newport* touched at Homer and Seldovia, at the mouth of Cook Inlet, but did not go up to Kenai. I had expected to reach Kenai from Homer on some passing boat, but there appeared to be very little traffic on the inlet. I waited a week at Homer without an opportunity to go up. The Cook Inlet Coal Fields Company, who own all the improvements at Homer, kindly accommodated me with quarters during this enforced stay, which was duly appreciated, as I was not provided with a camping outfit. At the end of a week I felt compelled to hire a sailboat in order to reach my destination. I induced the owner of a small sloop, which was put to sea on the high June tide, after having been on dry land all winter, to take me up there. We reached Kenai after a somewhat adventurous sail of two days and nights. The wind was unfavorable and the tides are so swift in the Inlet that the boat was at times carried back almost as fast as it had advanced.

I found the work at the Kenai Station advancing favorably. Mr. H. P. Nielsen, who has been in charge of the station from the beginning, deserves much credit for the amount and quality of the work which he has accomplished. Except for a few days on special occasions he has never had more than one man to help him, and most of the time he has been alone. He has built a barn and silo, both of logs. He has also built a station building intended for quarters for the superintendent and also to furnish storage room for seeds and specimens. A photograph of this building as it appeared at the time of my visit is reproduced in Pl. IX, fig. 1. The building was not finished at that time, but it has since been completed. He has cleared, fenced, and put under culture about 6 acres of land and more ground is cleared, off and on, whenever time can be spared from work required by the growing crops. (Pl. IX, fig. 2.) There has been but one yoke of oxen at the Kenai Station and one of these is getting old and gradually giving out. To replace him I bought a yearling from one of the residents and turned him over to Mr. Nielsen's care. Oxen are, in my judgment, the most satisfactory work animals for the pioneer Alaska farmer. The station oxen at Kenai live wholly on native feed, and are, therefore, maintained at practically no cost, except the labor of providing the feed. For stump pulling, plowing new ground full of roots, etc., oxen are far superior to horses. We have worked the oxen at Kenai in harness from the beginning. The yoke is used only to

keep them together. The harness is easier on them than the yoke and they can, therefore, get through with more work. I took a photograph of the oxen with their harness, and as it may be of service to other pioneer farmers, it is reproduced in Pl. X, fig. 1. The arrangement is very simple. It consists of a collar over which a pair of hames are buckled. A backband supports the traces and a strap under the chest holds them in place. Chains are used for traces. I bought this harness in Seattle, made to order at a cost of \$12 for the double set.

It has been our policy to gradually extend the clearing of land when time could be spared from other work. The timber is small and the task is not a difficult one, but the stumps are numerous, and it became necessary to devise some plan by which they could be pulled rapidly. The roots do not grow deep and it does not take great power to pull the average stump. A machine which was set up over the stump and worked by hand was first tried, but it proved to be too slow work, and it was too cumbersome to move. As a cheap and efficient means to aid in this work, I devised a simple stump-pulling tackle, consisting of two triple blocks and 300 hundred feet of 1-inch rope. One block is anchored to a solid stump and the other is attached to the stump it is desired to pull. When secured in this way the oxen are hitched to the rope and driven up slowly, and the stump usually comes out without trouble. The method of using this tackle is illustrated in Pl. X, fig. 2. Two men and a yoke of oxen pulled 6 stumps in fifty minutes while I was there. I mention this fact only to show that it is a simple and efficient machine.

The illustrations show the method of attachment when the stumps are cut high, or when they are very small. When the stumps are 12 inches in diameter, or when cut low so as to afford no leverage, we use a device of two timbers about 6 feet high, fastened together in the form of the letter A. To the top of this A is attached a chain or wire rope some 4 or 5 feet long and terminating in a hook. The A leans against one side of the stump and the hook is attached to a large root on the other side. The power is then applied to the top of the A, and as this is raised up the stump is tilted over. The device simply affords greater leverage than when the block is secured directly to the stump, as shown in the illustration.

The station had about $5\frac{1}{2}$ acres in crops, most of which consisted of grain. Winter wheat and winter rye had survived the cold weather and came out in the spring in fair condition, though the stand was in no case the best. A full line of the hardy vegetables had been planted, but the cabbage and cauliflower had been nearly destroyed by insects, and it was then too late in the season to raise new plants. Other vegetables were fairly promising, and the spring-seeded grains looked well.

May and June had been unusually dry. During the month of June the rainfall measured only six one-hundredths of an inch. In conse-



FIG. 1.—ALASKA STATIONS—WORK OXEN, SHOWING HARNESS, KENAI.



FIG. 2 —ALASKA STATIONS—STUMP-PULLING TACKLE, KENAI.



FIG. 1.—ALASKA STATIONS—HAY MAKING, KENAI.



FIG. 2.—ALASKA STATIONS—HAY MAKING, KENAI.

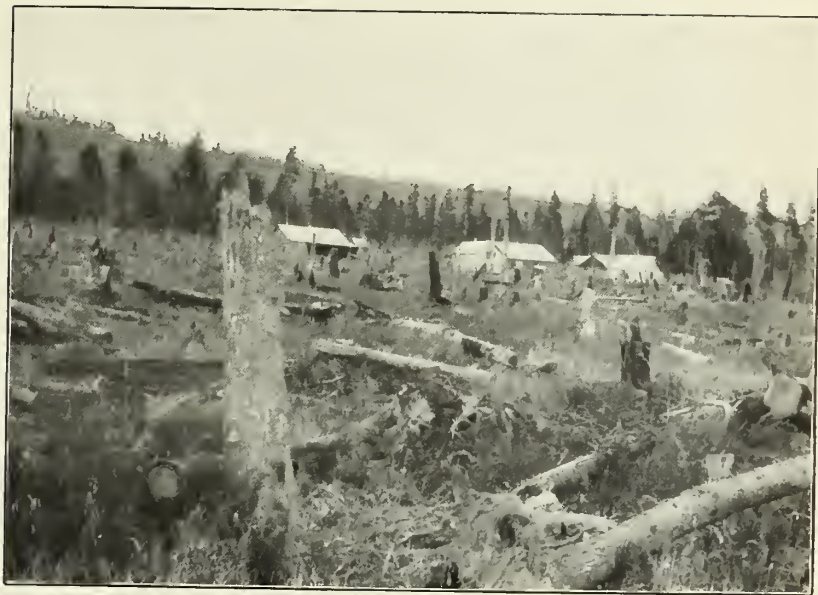


FIG. 1.—ALASKA STATIONS—A PIECE OF CLEARING NEAR HOMER, KENAI PENINSULA.



FIG. 2.—ALASKA STATIONS—STATION BUILDING AT RAMPART, YUKON RIVER.

quence of this the crops were backward for the season. They were revived, however, by later rains. The result of the season's operations is given in detail in Mr. Nielsen's report, which is submitted herewith. Pl. XI, fig. 1, shows a view of a cart load of hay.

On the whole, the writer regards the prospects for farming on the Kenai Peninsula as very promising. The success of the work at the station has stimulated many of the natives, chiefly those of Russian descent, as well as the Indians, to raise gardens of their own, or to extend the area and increase the varieties grown in the case of those who had gardens before. Potatoes are grown very generally and very successfully everywhere in that region as their main crop, but they raise also cabbage, kale, turnips, lettuce, and radishes.

I found that I could not reach Unalaska except by waiting nearly a month at Homer for the next boat going westward, and this being impracticable, I decided to return to Sitka with the *Newport*. Through the kindness of Mr. Gompets, superintendent of the Kenai cannery, I got passage to Homer on one of the fishing steamers belonging to this cannery, and arrived there just in time for the eastward trip of the *Newport*.

I returned to Sitka, June 29, and finding that Assistant Director Allen, of the Office of Experiment Stations, would be there shortly, I decided to await his arrival before starting for the interior.

There is much good pasture land in the neighborhood of Homer. I present herewith a reproduction of a photograph of horses at pasture (Pl. XI, fig. 2). The hill country back from the beach affords also an abundance of pasture. The nature of the country is indicated somewhat by a photograph of a clearing near Homer (Pl. XII, fig. 1). The buildings in this clearing belong to the Cook Inlet Coal Fields Company.

There are enormous deposits of coal in this region. It crops out on the high bank facing the beach, several thick seams being exposed. It is said to be of good quality, and it has the peculiar property that, although it is a soft coal, it does not soil a white handkerchief. This coal deposit will doubtless play an important part in the settlement of the region.

MAIL FACILITIES FROM SITKA WESTWARD.

Before leaving this subject, I deem it my duty to mention that the mail service at Kenai, and in general between Sitka and the westward, is very inadequate. Mail is carried between Sitka and Kenai only once a month and the boat stops at Kenai only long enough to land the mail, so that it is impossible to get replies until the next mail boat. On the return trip east, the mail boat does not stop at either Kenai or Sitka. Letters addressed to the Kenai Station can not be answered for a month after their arrival, and then they are carried to

Juneau and left to be forwarded to Sitka by the next mail boat. It takes, therefore, two months to get a reply from the Kenai Station.

It would be greatly to the convenience of our work if the mail boat could stop at Kenai on her return from Tyonek, and stop at Sitka on her way to Seattle.

REPORT OF H. P. NIELSEN, SUPERINTENDENT OF KENAI STATION.

KENAI EXPERIMENT STATION,

October 5, 1901.

DEAR SIR: I hereby submit my report for this season's work.

The grain has not matured as well as it might have done, because its growth was retarded by dry weather last spring. The winter grains matured, however, as did also the barley and two or three varieties of oats. The spring wheats did not amount to anything this year.

You probably remember when you were here that none of the grains appeared to be sown too thickly. Well, this fall when the wet weather set in, for every straw there was previously, ten sprang up from suckering, and now in each one of these bunches, especially in the oats, there is the original straw in the center with ripe grains, and all of these shoots are from 6 inches to 1 foot taller than the original stalk, but green. And it has kept this up right along. All through the oats and Manshury barley there were young shoots not headed out yet, others just heading, some in bloom, and all the way up to ripe grain, but the latter is but a small percentage of the whole. All the grains suckered in this way until it was thicker than hair on a dog's back.

The flax also, as you will notice, from sample sent, acted peculiarly. The seed which germinated early produced plants, which branched considerably but were of no value for fiber, while that which came up in July reached a height of 2 feet or a little over, and has very fine straight straw.

The ground is fertile; what it wants is cultivation and water. When the rain came everything started to grow, and grew fast, so fast that in fact it would not stop growing until the frost stopped it.

I did not keep any record of the growth of the field peas, but all the patches on which the stand of grain was not good were sown to field peas June 21. On account of the ground being so dry they did not come up until about July 10, and some as late as the 15th. They then made a good vigorous growth, however, and were about 2 feet high and in bloom when they were cut for hay September 16 and 17.

BUILDING OF STATION HOUSE.

I started to cut logs for the house the latter part of last October. Logs have been cut for building houses here in Kenai for a hundred years, and all the handy timber has been cut away. By going back about 2 miles, though, I found house logs, but they were scattering.

After cutting the 140 logs which I needed, I had logs here and there over half a square mile. To collect them I made a small sled just wide enough for the big end of the log to lie on, and used one of the oxen to drag them together. After I had them all piled up, I cut a road wide enough for the big sleigh and hauled them home with both oxen; this took until New Year. I finished hewing them February 21, and in the first part of March hired C. H. March to help me lay them up. The house was so nearly completed by the last of June that we moved into it, and the remainder of the inside work has been done since on rainy days.

CLEARING LAND.

About $1\frac{1}{2}$ acres additional land has been cleared this summer, stumps pulled, land plowed and disked, and it is now ready for cropping next year. This land is cleared about a quarter of a mile back in the woods, leaving a belt of timber between it and the sea. The southwest wind blowing up the inlet is always cold, and is thought to be a drawback to vegetation.

Sufficient hay for keeping the oxen and a yearling calf, bought this summer, has been cut and gathered during the summer. No grass has been put in the silo, chiefly because it is difficult to get grass near here, as the cattle have it pretty well pastured down. The wild grass which we use for hay grows some miles distant, and it is easier to transport the hay than the green grass.

EXPERIMENTAL GRAIN CROPS.

WINTER RYE.

Sisolsk.—A small plat of this rye was sown August 20, 1900, on new ground, which was fertilized with fish guano at the rate of 200 pounds to the acre; it came up in about ten days, and stood about 4 inches high when the ground froze. Stand uniform, but rather thin. On June 20 the stand was straggling and spotted; height 1 foot. July 1, growth straggling, some stalks 2 feet high, average 15 inches; beginning to head. July 15, 30 inches high, fully headed, and beginning to bloom. August 1, 5 feet high and in bloom; looks promising. August 15, average height $5\frac{1}{2}$ feet, some stalks over 6 feet high, going out of bloom, but does not seem to be forming any seed; suckering badly. September 2, average height 6 feet, some heads going out of milk, some in the milk, and some blooming. September 16, heads white, only about 50 per cent have grain in them, straw mostly green; it was harvested September 26. At this time there were suckers in all stages, some just heading out but the ripe straw was being broken down by strong winds. This is a new variety; the seed was imported from Russia by the United States Department of Agriculture.

WINTER WHEAT.

Sandomer.—A plat of this wheat was sown August 23, on same kind of ground as the rye. It came up in about 12 days and stood 4 inches high, when the ground froze. Stand good and uniform. On June 20 it was noted that the stand was good and uniform, 6 inches high. July 1, stand and color fairly good, 8 inches high. July 15, 15 inches high. August 1, 30 inches high, fully headed, and in bloom. August 15, 3½ feet high, still in bloom. September 2, some heads well advanced in the milk, new shoots numerous, and in bloom. September 16, lower half of straw turning yellow, heads also turning yellow. It was cut September 30. It was mostly ripe, but is not so early as the Yarasloff, and has more tendency to sucker. Seed was imported from Russia by the United States Department of Agriculture.

Yarasloff.—Sowed August 23, on the same kind of ground as the foregoing variety. It came up in about 12 days, and stood 4 inches high, when the ground froze. Stand good and uniform. On June 20, stand good and 6 inches high. July 1, stand and color good, 8 inches high; needs rain. July 15, 16 inches high, just beginning to head; promising. August 1, 36 inches high, fully headed, and in bloom. August 15, 4 feet high, going out of bloom, forming seed. September 2, in the dough, straw turning yellow, September 16, nearly ripe. It was cut September 30. The straw at this time was dry, but owing to continuous wet weather, the kernels were not quite hard. It wintered well, and on old ground and in ordinary seasons can be counted on to ripen. Seed imported from Russia by the United States Department of Agriculture.

SPRING WHEAT.

The following varieties of spring wheat were seeded May 10 and 11. Owing to the drought in spring and early summer they were slow in starting and in consequence the period of growth was shortened. None of them got fairly started to grow until the rain came, about the middle of July, and by the 1st of August they had scarcely begun to head. But from this date the excessive rain kept these wheats growing, and caused them to throw out shoots from the roots at such a rate that they formed but little grain. September 6 all were cut for hay. The varieties were Romanow, Russian, Pererodka, and Kubanka. All were imported from Russia, and all have been grown successfully at the Sitka Station. The Romanow matured at the Kenai Station in 1899.

BARLEY.

Manshury.—Seeded broadcast and harrowed in May 24 on both old and new ground, which had been given a dressing of 500 pounds of fish guano to the acre. On June 20 the stand was good, 3 inches high.

July 1, color good, but has made no growth on account of dry weather. July 15, 6 inches high, growing rapidly. Up to this time there is no difference between the growth on old and on new ground. August 1, stand uniformly 18 inches high, and 10 per cent headed on the old ground. On adjoining new ground, growth spotted, 6-30 inches high, rank spots headed. August 15, on old ground uniformly 2 feet high, fully headed; on adjoining new ground, stand 10 inches to 3 feet high, much of stunted growth not headed yet. September 2, on old ground 33 inches high; some in the bloom and some in the milk. On adjoining new ground, spotted, 15 inches to 3 feet high; rank spots in the dough, straw turning yellow. September 16, about one straw in ten with grain in the dough, the other nine-tenths are suckers, in all stages, some just heading out. On adjoining new ground, rank spots nearly ripe, stunted growth, some in the dough and some in the milk, straw green yet. It was cut October 4. Only the older heads were ripe; the suckers started too late to ripen.

Beartown.—Seeded in rows May 21 on old ground manured with fish guano at the rate of 500 pounds to the acre. On June 20, stand was good, 5 inches high. July 1, has made no growth for lack of rain. July 15, 10 inches high, running to stalk. August 1, growth spotted, 14-30 inches high, half of it headed. August 15, growth fairly uniform, 36 inches high, going out of bloom. September 2, in the dough, straw turning yellow. September 16, turning yellow and ripening. Cut October 5. This is the earliest variety of barley grown here. The only objection is that it sets too large heads for the strength of the straw. It lodges badly. It has large, plump grains. Grown from seed raised here in 1899.

Sisolsk.—Seeded in rows May 21, on same kind of ground as the Beartown. June 20, fair stand, 2 inches high. July 1, has made no growth, owing to the dry weather; turning yellow in spots. July 15, 4 inches high, yellow spots turning green again. August 1, 12 inches high, just beginning to head. August 15, 20 inches high, fully headed, about 20 per cent in bloom. September 2, 30 inches high, part of it in bloom and part in the milk, suckers numerous. September 16, about 20 per cent in the dough, the rest in all stages, straw green yet. It was cut October 5; suckers still green, early heads with firm grains in them.

Perm.—Seeded in rows May 21 on the same kind of ground as the two other varieties. June 20, stand good, 4 inches high. July 1, has made no growth on account of dry weather. July 15, 6 inches high, looks well, growing fast. August 1, 18 inches high, just beginning to head. August 15, 2 feet high and in bloom. September 2, average height, 33 inches, well advanced in the milk. September 16, in the dough and ripening. It was cut October 5. Grown from seed raised here in 1899.

OATS.

Burt Extra Early.—Sown broadcast at the rate of 2 bushels to the acre, May 24, on ground broken in 1899 and in oats last year. It was fertilized with fish guano at the rate of 500 pounds to the acre. June 20, stand fair, color good, 2-3 inches high, promising. July 1, 3-4 inches high, growing very slowly. July 15, average height 8 inches. August 1, 2 feet high, fully headed, looks promising, beginning to stool. August 15, 2½ feet high, beginning to bloom, suckers in all stages up to the heading out. September 2, well advanced in the milk, some in the dough. September 16, straw turning yellow, bids fair to mature. It was cut October 2; it was not all ripe, but a large percentage of it was; new suckers were growing up all the time.

White Russian.—Sown broadcast and covered with the harrow May 24 on new ground, which had been given a dressing of 500 pounds of fish guano to the acre. June 20, stand and color good, 3 inches high. July 1, 4 inches high, needs rain. July 15, 7 inches high. August 1, 15 inches high, beginning to head. August 15, 2½ feet high, fully headed. September 2, in the milk, standing up well. September 16, mostly in the dough, straw turning yellow and ripening. It was cut October 1; a good percentage of it was ripe. Probably the reason it stood up so well was, it was sown between the house and the woods; the house sheltered it from the south winds and the woods from the north. It was grown from seed raised here in 1899.

Siberian.—Sown broadcast May 23 on ground broken in the spring of 1900 and grown to oats last year. It was manured with fish guano at the rate of 500 pounds to the acre. June 20 the stand was fair, 2 inches in height. July 1, has made no growth. July 15, stand improved some, 6 inches high, color good. August 1, uniformly 12 inches high, a few heads showing. August 15, 20 inches high, not all headed yet. September 2, 3 feet high, about 50 per cent of it in the milk. September 16, about 40 per cent in bloom yet, 50 per cent in milk, and 10 per cent in dough, straw green. It was sown too thin, and when the wet weather set in it suckered, which accounts for the different stages. In some cases 12 straws had sprung up around the original one. It was cut October 1; only the earliest heads were ripe.

Improved Ligowa.—Seeded in rows May 16 on new ground manured last fall with fish guano at the rate of 300 pounds to the acre. June 20, stand and color good, 3 inches high. July 1, the most of it has made no growth; in spots it is 7 inches high, needs rain. July 15, growth spotted, average 8 inches high, spots 12 inches high. August 1, average height 18 inches, one-half headed. August 15, fully headed and in bloom, promising. September 2, 4 feet high, well advanced in the milk. September 16, in dough, straw turning yellow, chaff and hulls turning white. Cut October 3. This variety produces fewer

suckers than any other variety grown here; about 90 per cent of it ripened.

Black Finnish.—Seeded in rows May 22 on old ground manured with fish guano at the rate of 500 pounds to the acre. June 20, stand and color good, growth uniform, 3 inches high. July 1, color good, 4 inches high, growing a little. July 15, 7 inches high, uniform. August 1, 14 inches high, headed. August 15, 30 inches high, in bloom, promising. September 2, 3 feet high, in the milk. September 16, in dough, straw green. Chaff turning white and hulls black. Stands up well and bids fair to mature. It was cut October 5. The straw was not all yellow, but most of the grain is hard.

Tobolsk.—A plat was seeded in rows May 22 on old ground manured with fish guano at the rate of 500 pounds to the acre. Another plat was seeded broadcast May 24 on same kind of ground. On June 20 it was noted—rows, stand and color good, 3 inches high, promising; broadcasted, stand poor, 2–3 inches high. July 1, rows, stand and color good, 5 inches high; broadcasted, stand poor, had made no growth. July 15, rows, stand and growth uniform, 7 inches high; broadcasted, stand improved wonderfully. New stalks have come up since the rain, average 6 inches high, doing nicely. August 1, rows, stand uniform, 20 inches high, beginning to head; broadcasted, 1 foot high, no heads as yet. August 15, rows, 30 inches high, going out of bloom; broadcasted, 20 inches high, fully headed. September 2, rows, 3½ feet high, grain in the milk; broadcasted, suckering badly, few heads in the milk, some in bloom and some just heading. September 16, rows, grain in the dough, chaff turning white, straw green. This plat does not sucker much, and is uniform, will mature; stands up well; broadcasted, earliest heads in the milk, straw green, but the frost has turned the chaff white on all the heads. Will not mature any seed. This plat was cut for hay October 1; the straw was green and young shoots growing up all the time. The plat in rows was cut October 5. The straw was partly green, but about 75 per cent of the grain was ripe.

St. Petersburg.—Seeded in rows May 22 on old ground manured with fish guano, at the rate of 500 pounds to the acre. June 20, stand good, 2–3 inches high. July 1, has made no growth, but the color good. July 15, 5–7 inches high. August 1, stand uniform, 12 inches high, beginning to head. August 15, 2 feet high, fully headed and in bloom. September 2, 3 feet high, in the milk. September 16, 50 per cent in the dough, 50 per cent in milk; straw green, chaff on advanced heads turning white. It was cut October 5; only a small percentage of the grain was fully ripe; straw mostly green.

Zhelanni.—Seeded in rows May 21, on the same kind of ground as preceding variety. June 20, good uniform stand, 3–4 inches high. July 1, has made very little if any growth, color good. July 15, 7 inches high, growing fast. August 1, 12–20 inches high, about half

headed. August 15, the average height, 30 inches, going out of bloom. September 2, 3 feet high, in the milk. September 16, well advanced in the milk, a small percentage in the dough, with the straw turning yellow. It was cut October 5, straw mostly green, only a small percentage of firm grains. The seed was imported from Russia by the United States Department of Agriculture.

Banner.—Seeded broadcast, at the rate of 2 bushels to the acre, May 24, on both old and new ground, which had been given a new dressing of fish guano at the rate of 500 pounds to the acre. June 20, stand good, color excellent, 2 inches high. July 1, stand appears to have thickened some, but has made no growth upward. July 15, 6–8 inches high; up to this date there was no difference between growth on old and on new ground. August 1, on old ground, stand uniformly 14 inches high. On adjoining new ground, growth spotted, 6–24 inches high, no heads yet. August 15, on old ground, uniformly 20 inches high. On adjoining new ground, spotted, 8–30 inches high, stunted growth not headed, rank growth headed. September 2, on old ground, uniformly 4 feet high, mostly in bloom, some just past the bloom. On adjoining new ground, growth 18 inches to 4½ feet high, rank growth in the milk, stunted growth going out of bloom. September 16, on old ground, straw green, a small percentage in the dough, mostly in the milk. On adjoining new ground, rank growth, straw turning yellow, seed well advanced in the dough, stunted growth in the milk, straw green. It was cut October 3 and 4. Only a small percentage of grain was ripe, but the frost had turned the heads white. The straw was mostly green. On the old ground it suckered badly.

BUCKWHEAT.

Silver Hull.—Seeded in rows May 22 on ground broken in the spring of 1900 and seeded to oats last year. It had been fertilized with fish guano at the rate of 500 pounds to the acre. On June 20 it was noted just to be up, but sickly. July 1, about 20 per cent killed by drought, half the remainder drooping, and all looks sickly. July 15, 2 inches high, stand improved considerably since the rain, color fairly good. August 1, 8 inches high, in bloom, and looks fine. August 15, 1 foot high, still in bloom, no seed formed. September 2, in all stages, some in bloom, some seed just formed, and some in the milk. Killed by frost September 3, and cut September 13. I found when I cut it there was a small percentage of well-matured seed.

Japanese.—Seeded in rows, May 22, on same kind of ground as the preceding variety. It made slow growth all summer. August 1, 6 inches high, a few stalks in bloom. August 15, 8 inches high, blighted by cold wind, not looking well. Frost of September 3 killed it. It was a total failure.

Orenborg.—Seeded May 22 on same kind of ground as the other

two varieties. On June 20 only 40 per cent stand; looks sickly. July 15, stand improved since the rain. New plants coming up all the time. The few old ones not killed are beginning to bloom. August 1, spotted; 4 to 12 inches high, in full bloom. August 15, in bloom yet, some seed formed. September 2, in all stages, some blooming, seed just forming, and some seed ripe. It was killed by frost September 3, and harvested September 13. There was more seed on this variety than on the Silver Hull, but it was a partial failure.

EMMER.

Ufa spring emmer and *Yarasloff spring emmer* were tried. Seed of both varieties imported from Russia. Both matured at Sitka in 1899. The drought retarded their early growth and neither variety matured seed. Both were cut for hay September 26.

FLAX.

Riga.—Seeded May 23 at the rate of $2\frac{1}{2}$ bushels to the acre, on old ground which had received a dressing of fish guano at the rate of 500 pounds to the acre. On June 20 it was just coming up. July 1, stand fair, 1 inch high. July 15, much of it is 4 inches high, much more is just coming up after the rain. August 1, first half 12 inches high, beginning to bloom; second half 3 inches high. August 15, first half 2 feet high, in bloom, branching considerably; second half 8 inches high. September 2, first half 30 inches high, with some blossoms and some seed pods; second half 15 inches high, just coming into bloom. September 16, first half seed pods turning black; second half 2 feet high, in bloom. Cut October 5; very little seed is ripe. The part that came up last set no pods, though it has fine, straight straw and exceedingly tough fiber.

CLOVER.

Red.—Seeded May 30, 1900. Growth last year but light; survived the winter well, June 20, the stand was excellent, but growth not remarkable so far, the average height being about 4 inches; promises well. July 1, has made scarcely any growth; a few stalks in bloom; suffering from the drought. July 15, average height 7 inches, half of it in bloom. August 1, spotted, 6–12 inches high, 75 per cent in bloom. August 15, mowed for hay; a fair crop of hay was cut. September 2, 6 inches high. October 5, still green, but no longer growing.

Red and Alsike (mixed).—Seeded May 23 on ground broken in 1899 and grown to oats last year. June 20 it was just coming up. July 1, stand uncertain. More of it coming up all the time. July 15, one-half inch high; stand good. August 1, 1 inch high. August 15, $1\frac{1}{2}$

inches high; growing nicely. September 2, 4 inches high. September 16, 6 inches high. At this writing it is still green and seems to be growing. I regard it as being very promising.

FLAT PEA (*Lathyrus sylvestris*).

Seeded May 30, 1900, on new ground. On June 20 there were only a few plants showing above ground. Stand good last fall. July 1, stand fair, 2 inches high; growing very slowly. July 15, 6 inches high. September 2, growth becoming spotted, 6-10 inches high. September 16, 6-12 inches high; not growing much. At this writing the plants are still green, but not growing any. The stand is good.

POTATOES.

Potatoes were grown in both raised beds and on the level ground. There was no difference in the growth or in the yields. They came up about the same time, green tops the same size, and potatoes as nearly alike in numbers and size as two peas in a pod. They were planted in ground which was seeded to oats last year. It was given a dressing of fish guano this spring at the rate of 500 pounds to the acre. The yield was about eightfold; between 60 and 70 per cent were marketable.

The potatoes were planted May 18. July 1, just coming above ground. July 15, stand good, 3-4 inches high. August 1, 8-10 inches high; beginning to bloom. August 15, tops 1 foot high, in full bloom, well set with tubers. September 2, tops 14 inches high; some still in bloom. Nipped by frost September 3, but rallied and kept growing till the 23d, when they were killed by frost. They were dug on September 26 and 27.

It is the custom of the Russians in Alaska to raise beds a foot or more high on which to plant potatoes. In the experiment here referred to part of the ground was prepared with raised beds in accordance with Russian practice, and part of it was planted in the ordinary manner in order to see if the raised beds had any merit. In this instance the result shows they had not.

VEGETABLES.

The following vegetables were planted in a cold frame April 22: Cabbage—Jersey Wakefield and Early Winnigstadt; cauliflower—Snowball, Extra Early Paris, Dwarf Erfurt; Brussels sprouts—Improved Dwarf; kohlrabi—Large White; parsley—Extra Curled; lettuce—Thorburn Maximum Head, Early Curled Simpson, and Victoria Cabbage; broccoli—Early White.

The cabbage, Brussels sprouts, kohlrabi, and lettuce were transplanted in the open ground June 3. A species of caterpillar was very numerous here in the spring and it ate up everything except about

twenty plants of the Jersey Wakefield cabbage. These have done fairly well, a few heads being large enough to use by September 10.

The parsley seed failed to grow.

The cauliflower and broccoli were transplanted in the open ground June 17. The cauliflower did not get very large, but began to head about the middle of August. First used for the table August 24.

The broccoli did not head. It grew leaves 2 feet high, but set no heads.

On June 1 planted the following vegetables: Peas—First and Best and American Wonder; beans—Broad Windsor, Golden Wax, Valentine Wax; spinach—Long Standing, Thick Leaved; beets—Mammoth Long Red Mangel-Wurzel and Lents Extra Early Turnip; carrots—Half-long Chantenay and Half-long Danvers; parsnips—Thorburn Hollow Crown; onions—Large Red Wethersfield and Yellow Danvers rhubarb—Linnaeus; asparagus—Conover Colossal; and mustard—White London.

The caterpillars destroyed, as they came out of the ground, the carrots, parsnips, mustard, and most of the beets.

The American Wonder peas were 4 inches high and coming in bloom July 15. They had edible peas by August 10. The vines reached a height of 10–12 inches.

First and Best began blooming about the same time as the American Wonder, and had edible peas August 20. They grew nearly 4 feet tall.

The Broad Windsor beans made a vigorous growth and had numerous pods by September 1. None of them became full grown. Killed by frost September 3. The wax beans came up late in July, but were a total failure.

The spinach came up and went to seed.

The beets which were not destroyed by the caterpillars did fairly well. Some of them were 3 inches in diameter. The Mangel Wurzel, 2 inches in diameter and about 8 inches long. The onions did not do well. They were only large enough for sets. The rhubarb did remarkably well for the first season's growth and not being started in the cold frame.

The asparagus seed was a long time coming up, but the plants are about 6 inches high and thrifty.

Early Purpletop Milan turnips were sowed June 17, but the ground was so dry that they did not come up till about July 10. They made a vigorous growth and were large when pulled, October 1.

Respectfully submitted.

H. P. NIELSEN,

Superintendent, Kenai Experiment Station.

Prof. C. C. GEORGESON,

Special Agent in Charge of Alaska Investigations.

GROWTH OF FARMING AND GARDENING IN THE INTERIOR.

With a view to ascertaining what progress was being made in the interior along these lines of work, and more particularly to visit the Rampart Station and to see the condition of the work at Holy Cross Mission at Koserefsky, where the Father Superior had engaged to carry out certain experiments in grain growing, I started for the interior on July 19 by the overland route.

ITINERARY.

I obtained transportation from Sitka to Juneau on the revenue-cutter *Rush*, and arrived at the latter place July 20. From Juneau I went to Skagway on the *Al-Ki*, she being the first boat bound that way. I left Juneau on the night of July 22 and arrived at Skagway late in the afternoon of the 23d. On the 24th I took the train for White Horse. Left White Horse on the 25th and arrived at Dawson on the 27th. I was fortunate enough to get passage on a steamer bound for the lower river, and I reached Eagle July 28, Holy Cross Mission August 2, and Rampart August 13. I stopped here several hours, long enough to enable me to transact the necessary business in connection with the station. Mr. Jones, who had been in charge of this station for the past year, agreed to make the trip overland from Eagle to Valdez, and I therefore took him with me to Eagle, where we arrived August 18. I remained at Eagle until the 25th, when the *Leah* left for Dawson, which point was reached on the evening of the 28th. Dawson is the northern terminus for the boats on the lower river, and the distance from Dawson to White Horse is covered by boats of a smaller type, nearly all of which belong to the British Yukon Navigation Company. I left Dawson on the steamer *Yukoner* September 2, and arrived at White Horse September 7. There I took the train for Skagway, which was reached in the afternoon of the same day. I left Skagway again on the steamer *Cottage City* on September 9; arrived at Juneau on the 10th, and was fortunate enough to make immediate connection for Sitka by the *City of Topeka*.

I take great pleasure in acknowledging courtesies from the transportation companies in the interior. The White Pass and Yukon Railway Company gave me free transportation over their line; the British Yukon Navigation Company charged me for berths and meals only, and through W. H. Isom, esq., vice-president of the North American Transportation and Trading Company, I was tendered free transportation on all the boats with which he was connected on the Lower Yukon. This included the boats of the Northern Transportation Company, the interest of all lines having been pooled for the season.

GOOD GARDENS EVERYWHERE.

It was gratifying to behold the many and excellent gardens which were found along the river. At Eagle nearly every householder had a garden. Not only were the common vegetables quite generally grown, but flowers were also in evidence to a considerable extent. Many of the hardy annuals, such as poppies, nasturtiums, larkspur, and mignonette were in full bloom, and some of the more tender plants, as sweet peas, were in bloom at Eagle when I arrived there in the latter part of July, and there was abundant evidence that flowers as well as vegetables could be grown everywhere if they were given the requisite care. Such vegetables as potatoes, turnips, radishes, and lettuce could be seen nearly everywhere, and in several places cabbage, cauliflower, and kale were also grown successfully.

A resident of Eagle, who gave some attention to farming in 1900, promised to grow some grain the past season, but his interests elsewhere prevented him from doing so. It is, however, worthy of note that volunteer oats had come up in the little field he had in oats last year, and that it gave promise of a good crop. It would be difficult to adduce stronger evidence concerning the agricultural possibilities of that region than is furnished by this fact. Wherever grain will grow up, mature, and the waste seed live through the winter and produce a crop the following year, there certainly can not be much doubt but that farming is possible.

But it should also be noted that frosts are liable to occur at almost any time during the summer, and that in exposed places, especially on low ground along the river, these frosts may be severe enough to kill tender things. Thus a frost occurred in the neighborhood of Rampart and Fort Gibbon on July 31 of the present year, which injured many gardens in exposed positions, particularly those at Fort Gibbon, and the garden at the experiment station at Rampart was not entirely exempt. This frost, however, seems to have been confined to a limited area, for I did not note injury from it at Eagle nor on the lower Yukon in the neighborhood of Holy Cross Mission.

GARDENS AND EXPERIMENTS AT HOLY CROSS MISSION.

This mission is renowned in all the interior of Alaska, not only for its good work among the natives and the helping hand it lends to needy wayfarers, but also for its gardens. There are about 4 acres under cultivation, and the principal crop is potatoes, this vegetable forming one of the staple articles of food. Other kinds of hardy vegetables and a great variety of flowers are grown with marked success. While I was a guest at the mission, from August 2 to August 9, the table was daily supplied with new potatoes, lettuce, and radishes,

and frequently also with cabbage, cauliflower, beets, and turnips. What it is possible to do there would also be possible anywhere else on the lower Yukon. In the garden of the Sisters of St. Ann were also a great variety of flowers of the class known as hardy annuals. I found upwards of thirty varieties in bloom in the early part of August. The success of these gardens is, of course, largely due to the great care that is bestowed upon them. Thus there has been introduced a system of irrigation which is found of great service during periods of dry weather. A stream coming down from the hills has been dammed, a flume built, and sluices put in, so that it is possible to irrigate a considerable area of the cultivated ground. Hardly a weed could be found in the garden, and the tillage was well nigh perfect. One of the potato fields of the mission is reproduced in Pl. XIII, fig. 1, and shows a general view of the mission buildings. I have referred to the work at this mission in former reports. It may well be taken as a model in gardening.

In the summer of 1900 I entered into an agreement with Rev. Father R. J. Crimont, whereby he agreed to grow some wheat, barley, oats, buckwheat, and clovers during the past summer in an experimental way, and it was chiefly to note the outlook of these crops that I visited the mission. Owing to a rather injudicious selection of ground, the experiments were not a success. The ground was very wet naturally, and, therefore, cold, and could not be worked until late in the spring. Moreover, when the snow melted on the mountains in the latter part of May, it flooded this ground and made it all the worse. It was, therefore, not in good condition when the grain was seeded, on June 4. The growth was rapid in some places and slow in others, owing to the condition of the soil, and because of the wet ground the growth was prolonged more than it would have been on drier soil. When I was there in early August, the barley and oats had lodged in several places, grain was formed, but there was but little prospect of its maturing. A report on the experiment by Mr. V. O'Hare is submitted herewith:

HOLY CROSS MISSION,

Koserefsky P. O., Alaska, September 4, 1901.

DEAR SIR: I have the honor to report to you on the result of the grain-growing experiments instituted by you at this mission with R. J. Crimont.

Although the grains did not mature this summer, the result of the trial has shown that grain growing need not be entirely despaired of in this part of Alaska.

All chances seemed to combine against it this particular summer. The season was unusually short from June 4, when the seed was put in, until August 31, when a frost destroyed the potato tops. The seed was sown too thick, and during the second half of the season, just when the grain needed heat, the weather was uncompromisingly wet and cold.

In our more favorable seasons, provided the seeds were sown in good ground, the grain would probably mature. These favorable seasons occur every two or three



FIG. 1.—ALASKA STATIONS—HOLY CROSS MISSION, YUKON RIVER.



FIG. 2.—ALASKA STATIONS—NATIVE GRASS AT KOSEREFSKY, YUKON RIVER.

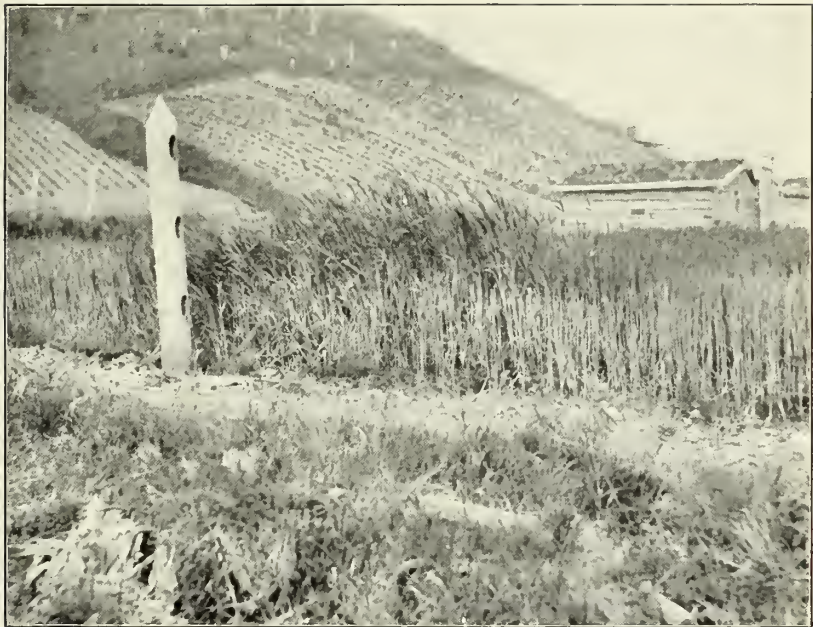


FIG. 1.—ALASKA STATIONS—BARLEY AT HOLY CROSS MISSION.



FIG. 2.—ALASKA STATIONS—WHEAT AT HOLY CROSS MISSION.

years, hence we may conclude that grain can be successfully cultivated every few years in this part of Alaska.

I am sending samples of the wheat, barley, and oats. The frost of August 31 entirely destroyed the buckwheat. As for the clover, it grew to a respectable height, but did not blossom.

Yours, very respectfully,

V. O'HARE.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

Pl. XIV, figs. 1 and 2, gives views of portions of these grain experiments. Fig. 1 shows the barley and fig. 2 the wheat.

In the neighborhood of the mission is an extensive meadow of native grass. This grass grows as high as a man's shoulder. I wanted to get a photograph of the cattle in the grass, and for this purpose asked to have them turned into the meadow, but they were entirely lost to sight when they got into the grass. Four of the five head of cattle were native born, and, of course, had lived exclusively upon native feed. They were in most excellent condition. A view of this meadow can not fail to convince the most skeptical of the fact that it is possible to grow cattle feed there in unlimited quantities. The meadow is shown in Pl. XIII, fig. 2.

WORK AT RAMPART STATION.

As stated in last year's report, a tract of land containing about 313 acres has been reserved for an agricultural experiment station opposite the town of Rampart, on the Yukon River. The tract was, and nearly all of it still is, virgin forest. The whole area is covered with spruce, interspersed with an occasional poplar and birch, and under the trees the ground is covered thickly with moss. The features which recommended this tract for an experiment station were, first, the location, and secondly, the nature of the soil, and its exposure. The greater portion of it is a gentle slope facing the south.

When I left the Yukon in August, 1900, Mr. Isaac Jones, the assistant assigned to the work in the interior, began work here, at Rampart. The means at our disposal did not admit our purchasing implements and work animals, nor could we even hire men to work. With the exception of a single laborer, who was hired for about two weeks, Mr. Jones performed the work single handed and alone with ax, mattock, and spade. He began clearing a patch of ground, grubbing out the stumps, and digging up the earth so as to get as much as possible ready for seeding, in order that we might test grain and the commoner vegetables during the present year. Mr. Jones cleared and prepared in this way about half an acre of ground. This is but a small beginning, but the best that we were able to do. The cheapest rate at which labor could be hired was \$5 a day, and the lowest charge for the hire of teams was \$10 a day. Could we have had a team and

two or three men, and been provided with a stump puller, and other farm implements, much more could, of course, have been accomplished. I would respectfully submit that if the work is worth doing at all it is worth the expenditure necessary to equip and maintain the station in a modest way—with a team, stump puller, plows, and other necessary farm implements. To do this, however, will cost about five times more than it would cost to equip a similar station anywhere in the States. I had Mr. Jones look up a team of horses with a view to buying them if they could be purchased within our available means. He found a team of average weight and in fair condition, which the owner was anxious to sell, but he could not afford to sell them for less than \$800, and considering the expense of importing them, they were worth that; but we were unable to buy. For the same reason no house or cabin was built at this station the past year. Mr. Jones could not handle the logs alone and I was unable to authorize him to hire labor to help. He was fortunate enough, however, to get the use of a wood chopper's cabin, which had been built on the bank of the river a year or two before. It was poorly built and in a dilapidated condition, with the roof leaking so badly that until repaired Mr. Jones found it necessary to put a tent up inside in order to keep dry at night. It had a single small window, and a floor made of poles after the fashion of a corduroy road. Such were the quarters we were obliged to occupy the past year. A photograph is produced herewith (Pl. XII, fig. 2).

EXPERIMENTS WITH GRAIN.

Mr. Jones found a clump of volunteer rye in the lot back of the North American Transportation and Trading Company's store. How it got there nobody knew, but in all probability it was a handful which had been scattered from a sack of feed. It was a fall variety which had stood the winter and had come out in the spring in a sufficiently healthy condition to mature seed. This fact was proof of its hardiness. He gathered the grain and seeded it in raw, rough ground on August 15. A few spears had pushed through the soil on the 28th, and the growth from that date until the patch was covered with snow proceeded slowly. Apparently every seed germinated, and the rye went into winter quarters in good condition. It began snowing early in October, before there had been any severe frost, and the amount of snow gradually increased with the cold. By the 1st of November the snow was about 15 inches deep, and later in the winter it was increased to 3 feet. This appeared to be a sufficient covering to protect the grain from the severe frost for, although the thermometer is said to have registered more than 70° below zero, the rye was not injured in the least. It came out in excellent condition in the spring. The snow was not a sufficient covering, however, to keep the ground from freez-

ing. Owing to the removal of the moss which enabled the sun to reach the surface of the earth, and doubtless aided also by the tearing up of the roots, the soil had thawed out to a depth of 18 inches by the time the rye was seeded; but in spite of the snow covering, the ground nevertheless froze again during the winter clear down to the old ice.

On May 13, 1901, the snow melted from the plats, and the rye appeared green and in perfect condition. The plants tillered abundantly, sending out from 10 to 18 shoots each. It grew very rapidly. On June 23 it was 2 feet high, with heads showing here and there. On July 20 average stalks measured 5 feet 4 inches high. At that date the heads were filling rapidly. On the night of July 31, there was a light frost, sufficient, however, to kill potato tops and other tender vegetation. But the rye and in fact nearly all of the grains were not injured. The grain was then in the dough state and almost ready to cut. Most of it was cut on August 3. When I was at the station August 13, some of it which had not been cut was perfectly ripe, and it had a good quality of grain.

This then proves that winter rye can be grown in that latitude. Rye is the principal breadstuff in all northern latitudes. Northern people prefer it to wheat, and it is probable that the future farmers of Alaska will likewise make rye a principal crop.

It should be noted also that the past winter registered the coldest weather in the interior that the proverbial "oldest inhabitant" has ever known. The test is, therefore, as severe as it is likely to be at any future time.

SPRING GRAIN.

Patches of several varieties of spring grain were sown in the latter part of May. But I have at this writing received no word from the Yukon since I left the station on August 13 as to whether they matured or not. At that date the barley and the rye were the only grains which had matured. Several other kinds had fully formed grains, and would soon begin to ripen, but having no information concerning their later development I can note only their growth and condition up to the date of my visit. The spring grains seeded were as follows:

Spring rye.—A plat was seeded May 21. By July 7 the plants had reached a height of 18 inches and were showing heads. On July 31 the stalks were 5 feet high and the grain two-thirds formed. On August 13 the grain was fully formed, but still green, and in the soft dough.

On June 5 another plat of spring rye was seeded. The growth was rapid but the stand thin, and the plants did not tiller. July 10 the stalks averaged 20 inches and the heads were showing. July 31 the stalks were 4 feet 7 inches high and the grain forming. August 13 the grain was rather more than half grown.

BARLEY.

Manshury.—A plat of this barley was sown May 23. It was somewhat slow in starting, but when it came up the stand was good and the plants healthy in appearance. On July 12 it was 16 inches high and beginning to head. On July 31 it was $2\frac{1}{2}$ feet high and the grain nearly grown. It was not injured in the least by the frost that occurred on the night of that date. August 13, when I was at the station, it was ripe and ready to cut at any time. The grain was plump, the heads heavy, and quite yellow in appearance. The accompanying illustration (Pl. XV, fig. 1) is a reproduction of a photograph of this patch of barley. It is another proof in addition to the many already on record that barley can be grown very successfully in the interior. The only point to note being that early maturing varieties should be selected.

On June 5 another plat of the same barley was seeded. July 18 it was 18 inches high. July 31 it was $2\frac{1}{2}$ feet high and the grain about half grown. It was not injured by the frost. August 13 the grain was fully formed, but it had not begun to ripen.

OATS.

Burt Extra Early.—A plat of this variety was seeded June 4. It started to grow promptly. The plants were healthy and made an even stand. July 18 it was 15 inches high and had begun to head. July 31 it was $2\frac{1}{2}$ feet high and the grain half formed. It was not injured by the frost which occurred on the night of that date. August 13 the grain was fully formed, but still in the milk, and showed no signs of ripening. This variety has, all things considered, given the best satisfaction of the many kinds tried at the Sitka and Kenai stations. It is not a heavy yielder. The straw is short and the grain small, but on the coast it has matured in time to be harvested before the fall rains set in, as a general thing, and in the interior it will probably prove to mature before killing frosts occur in late summer.

Perm.—A variety of Russian oats imported by the United States Department of Agriculture. The seed used was grown at the Sitka Station. It was planted May 23. It grew promptly and made a good stand. July 14 the plants averaged 16 inches high. July 31 the crop was 32 inches high, the grain almost fully formed, and heads of fair size. It was not injured by the frost of July 31. August 13 most of the grain was still in the milk and had not begun to ripen. It was 4 feet high. I have not heard if it matured.

Another plat of the same variety was seeded June 6, also from Sitka seed. July 19 it was 18 inches high and heading out. July 31 it was 27 inches high and the grain rapidly developing. It was not injured by the frost. August 13 it was in the milk.

Flying Scotchman.—Small plats were seeded of this and also of the

FIG. 1.—ALASKA STATIONS—RIPE BARLEY, RAMPART, AUGUST 13, 1901.



FIG. 2.—ALASKA STATIONS—GRASS, RAMPART CREEK.



following variety, but both were too late to mature the past season. It was seeded June 4. July 31 the tallest stalks were 26 inches high, only about half headed, and beginning to bloom. It did not appear to be injured by the frost of that date, but it is doubtful if it matured seed.

Common oats (such as is offered for sale for feed).—A plat was seeded June 4. By July 31 it was about 2 feet high and heading out. It was slightly injured by the frost of that date.

Russian White.—This variety was also grown from seed produced at the Sitka Station. The plat was seeded June 4. July 24 it was 16 inches high and beginning to head. Rather uneven in growth. July 31 the best was 2 feet high and in bloom. August 13 the grain was half grown. This variety is not an early one, and probably not as well suited to this region as some of the others named.

SPRING WHEAT.

Ladoga.—Plat seeded May 29. It appeared slow to start and the plants were not vigorous. July 24 it was 15 inches high and beginning to head. Foliage was rather light in color. July 31 it was in bloom. The heads with the blossoms exposed were injured by the frost of that date. August 13 the heads which were not injured were beginning to fill.

Romanow.—Seeded May 23. July 19 it was 22 inches high and beginning to head. July 31 it was 3 feet high, and some heads had passed the blooming stage; others were still in bloom. Those in blossom were injured by the frost. August 13 the earliest heads had grain three-quarters grown, and it may have matured. The Romanow has been our most successful variety at the Sitka and Kenai stations.

Roumanian.—A plat was seeded May 29. It started slowly, but the young plants were stocky and healthy. July 21 it was 23 inches high and beginning to head. July 31 it was 3 feet high and for the most part past bloom. It was a vigorous grower, and was not injured by the frost. August 13 the grain was fully three-fourths grown. It may have matured.

Another plat of the same variety was seeded June 6. July 21 it was noticed that the earlier seeding was slightly more vigorous. August 13 most of the heads had grain half grown, but it had not caught up with the earlier planting.

The central facts in these grain experiments as far as they are known to the writer at this date, are: First, that fall seeded rye lived through the winter, came out in the spring healthy and vigorous, and produced plump and perfectly matured grain by the beginning of August. Secondly, that barley seeded in the latter part of May matured seed by the middle of August. In last year's report several instances were reported of grain maturing at various points on the Yukon.

CLOVER.

May 23, two plats were seeded to clover, one alsike and the other red clover. The seeds started slowly in both cases, but eventually made a good stand. August 13 both beds were about 9 inches high. The alsike seemed to be slightly the more vigorous. Some red clover was also scattered on ground that had been burned over, but neither cleared of brush nor dug up.

VEGETABLES.

Mr. Jones makes the following report on the growth of vegetables:

A cold frame was sown to lettuce, cabbage and turnips on August 15, 1900, in order to see what they might do. The soil was new and raw and the plants made only a poor growth, and on the whole went into winter quarters in poor condition. When the frame was uncovered May 13, 1901, nearly all of the plants had been eaten by field mice, but a few plants of cabbage and lettuce were still growing. The muslin covering and the snow had been sufficient to protect them against winterkilling. Some turnips sown outside the frame in the fall, and which had no artificial covering but the snow, came through the winter alive, but soon after growth started in the spring they were eaten by insects.

In the spring of 1901 a plat of sandy loam was selected close to the river which was planted to vegetable seed as soon as the soil could be worked. The selection of the ground proved unfortunate, as the unusual rise of the river washed away a portion of the garden, and for nearly a month the surface of the water was almost on a level with the portion which was not washed away. All growth ceased and, with the exception of radishes and lettuce, vegetables on this piece of ground were an entire failure. Later, vegetable seeds were planted in soil well back from the river. Here the flea-beetle appeared in large numbers, and radishes, turnips, and the first planting of cabbage plants suffered greatly from them. Rabbits also visited this patch, and beets, peas, and cabbage suffered in consequence. Such plants as escaped these pests grew rapidly—lettuce, kale, peas, onions, and carrots being worthy of special mention. The soil was worked down to a fit condition for vegetable seeds with much labor, and the result on this land was more favorable than was hoped for at the time of planting.

A large number of persons received seed from the station this year, and many of them report much success with their gardens.

There are a number of good gardens in Rampart this year, Capt. A. D. Williams having one of the best. Captain Williams has been a successful gardener in Alaska for some years, and the present season he has over an eighth of an acre in cultivation. Capt. Alfred Mayo is one of the oldest gardeners in this section of the country and has been very successful in this line.

BUCKWHEAT.

On June 6 two small plats, were sown with buckwheat. Plat No. 1 to seed from Maine, and No. 2 to a Russian variety. The Maine seeds sprouted quickly and produced a good stand of thrifty plants, which had reached a height of 16 inches and was beginning to bloom on July 20. July 26 an average stalk was 22 inches high. Plants were killed to the ground by the frost of July 31. The Russian variety did not start readily and the stand was poor, but the stalks were vigorous and made a rapid growth. July 17 a few stalks were in bloom, and average stalks were 20 inches in height. July 26 average stalks were 28 inches high, with the grain forming. Killed to the ground by the frost July 31.

POTATOES.

A small quantity of seed potatoes grown at Rampart, last year, was obtained, placed in a shallow box, partly covered with sand, and exposed to the light May 1. At the same time a few pounds of outside potatoes were obtained and these were treated in like manner. Both lots were planted May 23. The soil was rather wet and stiff for planting at this time, and the weather continued cold and damp for some time afterwards. The first potato leaf showed through the soil June 16. From that time on growth was rapid. July 15, stalks from native seed showed blossoms, while the other variety bloomed June 24. Frost of July 31 killed the stalks to the ground. Native seed had at this date produced potatoes as large as an egg, while outside seed produced only very small potatoes.

SETTLEMENTS ALONG THE YUKON.

It may be interesting to name the leading settlements along the river and the approximate distances between them, in order to give some idea of the extent of the territory. The distances here given are only approximate and may vary somewhat in either direction.

Eagle City, which is the first town in American territory, is 106 miles from Dawson. It is beautifully located on high ground in a bend of the river near Eagle Mountain, which is an imposing mass of granite rising to a height of about 2,000 feet. This town will undoubtedly be an important one, especially if the projected railroad through the interior should terminate here. It lies on the margin of a large tract of land sufficiently level to be brought under culture. There is a permanent population of some hundreds of people, and Fort Egbert, which is garrisoned with about two hundred soldiers, is located here.

From Eagle to Circle City is a distance of about 175 miles. This town is located in the border of the "Flats," and the region of the immediate neighborhood is treeless. It is likewise a town which is destined to be permanent. It has come into prominence because it is

the nearest point on the river from which the gold fields on the tributaries of the Tanana can be reached. The absence of timber gives the place a somewhat desolate appearance, but it is a thrifty, enterprising town and is constantly growing in population. Probably a large percentage of the vast expanse of level country in that neighborhood can be used for agricultural purposes.

Fort Yukon is located a few miles inside the Arctic Circle, at the mouth of the Porcupine. It is about 85 miles northwest of Circle City. This is an old settlement, having been a trading post of the Hudson Bay Company many years ago, but it has never become an important post. The permanent white population probably does not exceed one dozen persons, and the Indians in the place are not numerous. A reservation for an experiment station was made there in 1900, but the available funds have been too limited to do any work there.

Rampart is a thriving town, some 200 miles below Fort Yukon. There are several hundred log cabins in this place and a few quite good houses. It takes its importance from the proximity of the placer mines on Minook Creek and its tributaries. The country in the immediate vicinity is rolling, but there is considerable agricultural land in the valleys. The vegetation is luxuriant wherever the ground has been cleared. Pl. XV, fig. 2, gives an illustration of the height of the grass in the valley of Minook Creek. The photograph from which this reproduction was made was taken by Mr. Erastus Brainerd.

Tanana, the next settlement of importance, is located about 80 miles below Rampart; it is at the mouth of Tanana River. The post-office is named Tanana. The settlement was originally called Weare, and the trading post of the North American Transportation and Trading Company still bears this name. Fort Gibbon is located here. It was built in 1900 and has a garrison of approximately two hundred men.

The next settlement of importance is Nulato, located about 225 miles below Tanana. Nulato is an Indian settlement of considerable size. There are also a couple of stores and a Roman Catholic mission. The surrounding country is sufficiently level for cultivation. Pl. XVI, fig. 1, is of interest because it illustrates the leading industry of the Indians during the summer months, namely, the catching and drying of fish. Large quantities of salmon are annually caught at various points on the Yukon; the fish are cleaned, cut in halves, and dried on poles, as shown in the illustration.

Anvik is the next important settlement. It is about 190 miles below Nulato. The population is chiefly Indians, but there are also a number of white people and an Episcopal mission. A portion of the town is illustrated in Pl. XVI, fig. 2. From Anvik to Holy Cross is a distance of about 30 miles. This settlement has already been referred to in detail. Some 80 miles below Holy Cross is a little settlement



FIG. 1.—ALASKA STATIONS—FISH DRYING AT NULATO, YUKON RIVER.



FIG. 2.—ALASKA STATIONS—ANVIK, YUKON RIVER.

known as Russian Mission, missionaries of the Russian Church being established here. And still nearer the mouth of the river, in the treeless region, is the settlement of Andreaoffski, a place which is chiefly of importance because it affords winter quarters for the river boats, and the storehouses belonging to the commercial companies are located here. The whole distance from Dawson to St. Michael is nearly 1,500 miles. Besides the places named, there are many small Indian villages, and during the summer many temporary fishing camps are established along the river.

The transportation on the river is carried on by means of a number of steamers, some of which are large and powerful boats with first-class accommodations for passengers in every respect. These boats consume an immense amount of fuel, as it takes great power to propel them against the current. They have sometimes two or three barges in tow. Wood is the principal fuel used, though coal is used to some extent and its use will probably increase with the development of the coal mines along the river. The boat is tied to the bank, a gang-plank thrown ashore, and a number of men carry the wood aboard on their shoulders. There is considerable coal mined on the lower Yukon, which is used for supplying steamers (Pl. XIX, fig. 2).

A telegraph line has been built by the War Department from St. Michael to Fort Gibbon.

FARMING AT DAWSON.

At Dawson I found several persons engaged in raising produce for the city market. The most extensive farmers at that place are two brothers named Morgan. They are American citizens who have tried their luck at prospecting; but although they were fairly successful they prefer farming. Mr. J. A. Morgan, one of these brothers, informed me that he had rented 110 acres of land from the Canadian Government on the west side of the river just across from the city for a rental of 50 cents an acre a year. He has a lease for ten years, with the privilege of buying at the end of that time. The price of land was not to be fixed, however, until the expiration of the lease. He grows vegetables on a rather extensive scale, confining himself to the standard crops, such as potatoes, cabbages, cauliflowers, turnips, radishes, and lettuce. He also grows grain for hay. This year he had 40 acres in oats. These oats were seeded on May 20 and cut for hay early in August, at which time they were almost ripe. It is more profitable to cut the grain for hay than to let it mature. The past season grain and hay sold exactly at the same price per pound, namely, 6½ cents, or \$130 a ton. This was Mr. Morgan's first year and, therefore, he did not have all the land in condition for cropping. He was clearing and preparing the rest of the farm for crops the coming sea-

son. His brother had an equal area of land on the same terms, and he planned to follow the same line of work.

Pl. XVII, fig. 1, is a view of Mr. Morgan's house. The fenced portion of the front yard was well stocked with flowers, which were tenderly cared for by Mrs. Morgan, but they do not show up well in the illustration. Pl. XVII, fig. 2, is a view on Mr. Morgan's farm, looking east. The city of Dawson is in the background to the right on the other side of the river. There were numerous vegetable gardens in various places about Dawson, but more particularly on the west side of the river, and all of these did a thrifty business.

Pl. XVIII shows a display of native grown vegetable in the butcher shop belonging to Mr. J. G. Boyd. The list comprises the following: Cabbage, rhubarb, kale, native cranberries, cucumbers, lettuce, peas, radishes, turnips, cauliflower, carrots, and new potatoes, all grown at Dawson, and for sale there in the latter half of August. This illustration simply adds one more item to the already voluminous testimony which we have in regard to the possibilities of the interior of Alaska.

I met the owner of a hay farm which I was told had proved quite profitable. The owner was Mr. Samuel Henry, and his farm is located in the valley of the Stewart River, 25 miles from its mouth. He has 80 acres under cultivation, and he devotes nearly the whole area to hay, which, at the price named above, it can readily be seen is a profitable business.

WHAT OTHERS SEE IN THE YUKON VALLEY.

I submit herewith an article on the agricultural possibilities of the Yukon Valley by Mr. Erastus Brainerd. It is of interest because it expresses the views of a private citizen who has spent years in the country, who by both education and training has been accustomed to look for facts, and who records the facts as he sees them without bias or prejudice on one side or the other. In the course of looking after his interests in the interior, Mr. Brainerd has had occasion to make extensive trips through the country in many directions; he has noted the characteristics of climate, soil, and vegetation peculiar to the various regions he has traversed; he has obtained information from hundreds of prospectors whom he has met; he has studied the results arrived at by other investigators, and he has noted the facts as regards the agricultural possibilities of other countries in the same latitudes and with similar climatic conditions. From this accumulation of data, he comes to the conclusion that agriculture in Alaska is destined to play an important rôle in the development of the resources of the Territory, and that as a matter of course it will also be an important factor in the growth of population and its future history. Of the thousands who visit Alaska there are comparatively few who are as



FIG. 1.—ALASKA STATIONS—FARMHOUSE, WEST DAWSON, YUKON RIVER.



FIG. 2.—ALASKA STATIONS—ON MR. MORGAN'S FARM, WEST DAWSON, YUKON TERRITORY.

ALASKA STATIONS—KLONDIKE-GROWN VEGETABLES DISPLAYED IN DENVER MARKET, DAWSON, YUKON TERRITORY.

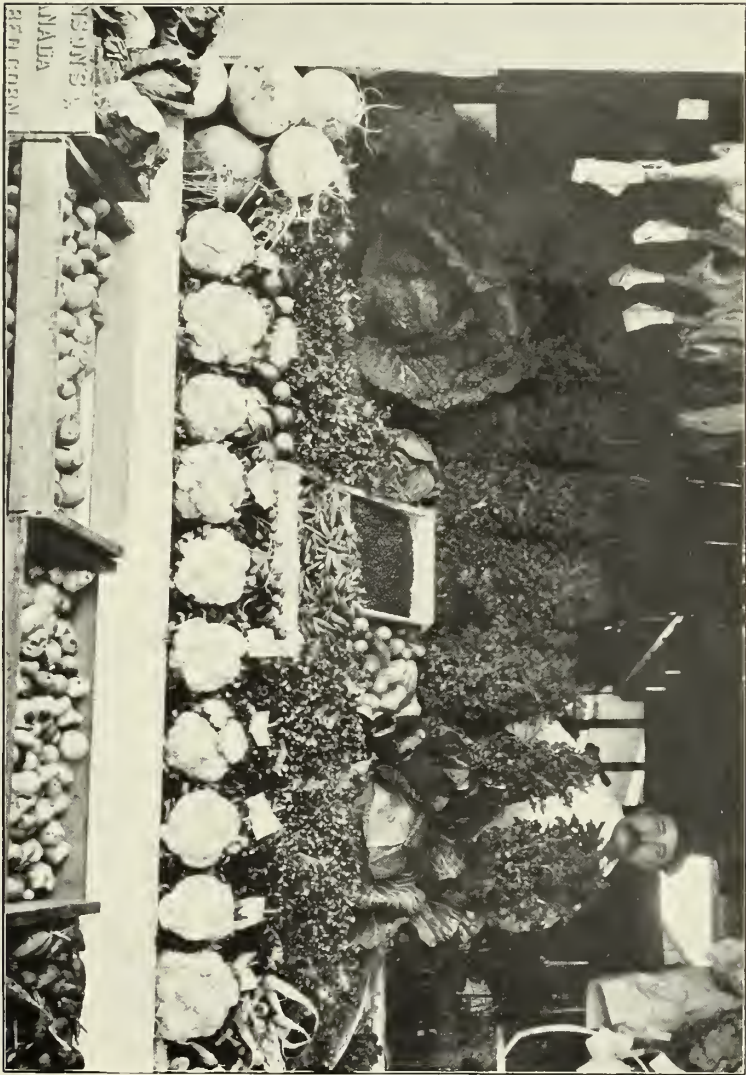




FIG. 1.—ALASKA STATIONS—VALDEZ, AS SEEN FROM THE BAY, GLACIER IN THE CENTER.

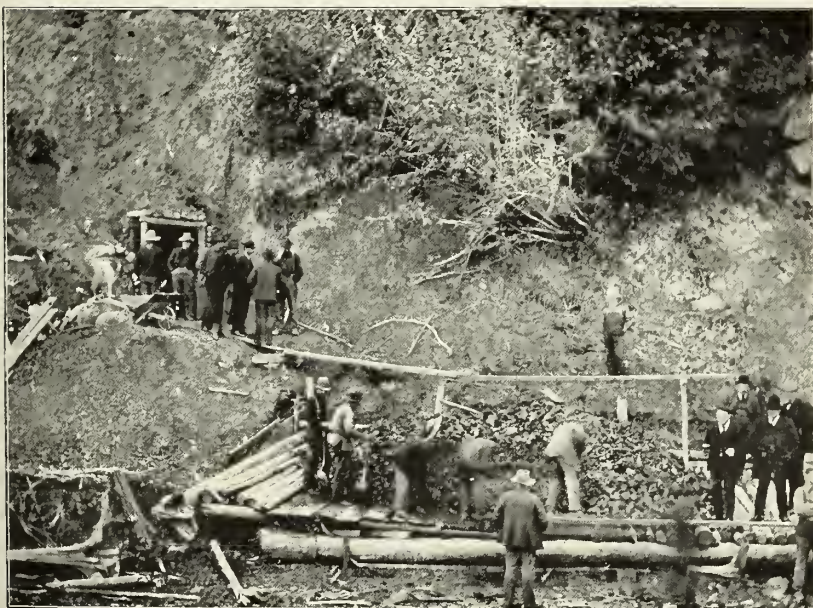


FIG. 2.—ALASKA STATIONS—COAL MINE ON THE LOWER YUKON.

competent to note facts and to interpret them as Mr. Brainerd has done. Most people who go there have preconceived ideas of the country and its possibilities. These ideas have as a general rule been based on the well-nigh universal opinion that Alaska is a barren, useless waste, and they are unable to correct and readjust these ideas so as to conform to the actual facts. Mr. Brainerd's article appeared in the *Seattle Post-Intelligencer* of September 29, 1901, and is as follows:

YUKON VALLEY FARMS.

Omne ignotum pro terribile—the unknown is a terror—was a common saying with the Romans before the Christian era. So when I went up the Yukon four summers ago and wrote to the *Post-Intelligencer* that what impressed me most was the luxuriant vegetation, the size of the timber, and the apparent agricultural possibilities, I was not only laughed at by the incredulous, but was asked seriously, "How can anything grow in that terrible frozen region?" Three short years have broadened the knowledge of many, but still the doubters are more numerous than the believers. I hope to show to their satisfaction that the "agricultural possibilities of the Yukon" are neither so visionary as the mirages nor so uncertain as the movement of the auroras which are common in that country, and to-day I present the first photographs that have been made public of actually growing cereals.

Let me first call attention to the fact that it is within the memory of men when the rich and fertile States of Nebraska, Kansas, and Colorado were marked on the maps as the Great American desert. If the great American desert now blooms with valuable wheat, if not with the beautiful rose, the watersheds of the Yukon may yet be known as the seat of a thriving agricultural community. Of course, the public is becoming familiar with the argument from analogy in the case of Finland, which lies largely in the same latitude as Alaska. It is well known that that country, with only 50,000 square miles of agricultural land, sustains over 2,500,000 people; that at their last report they raised 28,000,000 bushels of cereals, 4,000,000 pounds of flax and hemp, had nearly 3,500,000 cattle and sheep, and exported butter, cheese, oats, and live stock. If a stronger argument from analogy be sought it may be found in the report for 1897 of Alexander Platonovich Engelhardt, governor of the the Russian province of Archangel, which borders on the Arctic, extends to 71° north latitude, and has by far the greater part of its area north of the sixty-sixth parallel.

A MATTER OF ISOTHERMS.

Archangel, its chief town, has nearly 20,000 population, and is in the latitude of the settlement of Nulato on the Yukon. In 1897 the population of the province was 350,000 persons, who in that hyperboreal region raised 60,000 tons of wheat, rye, oats, and potatoes, owned 260,000 cattle and sheep and 280,000 domestic reindeer, and exported over \$1,000,000 worth of wood, cereals, butter, and flax. In all the province, Governor Engelhardt says, there are only 216,000 acres of agricultural land and 516,000 acres of pasture land.

But the argument from analogy is often fallacious. If a man were to speak of olives and oranges grown in the latitude of Denver, Indianapolis, or Philadelphia, he would be jeered at by the unthinking, yet that is precisely what is done in California in the latitude of these cities, while apricots and prunes are grown in the State of Washington north of the latitude of Nova Scotia and New Brunswick.

Agriculture is a matter of isotherms and not of latitude, and the isothermal lines in the Yukon Valley, so far as is known, are more favorable to agriculture than those of Finland, for while the winters are colder the summers are hotter. Coming to the

actual climate and soil of the Yukon watershed, let us see what they are, what they are doing for agriculture and can do. The records are incomplete, but they show a high range of temperature which will surprise the uninformed. At Fort Yukon, which is just inside the Arctic Circle, Dr. W. H. Dall, now in the Government service, reported in 1868 that the temperature in July "not in the direct rays of the sun" was 112° F. In June, 1900, the record for the month showed a maximum of 93°, and in July 87°. At Eagle, near the Canadian border, May to August, inclusive, showed a daily average maximum of 79°. Holy Cross Mission, which is less than 350 miles from St. Michael, showed an average maximum for May to September, 1899, of 69°, with a maximum of 82°. The 6-inch soil thermometer at Fort Yukon gave a daily average for June, 1899, of 50.8°, and July gave 54.9°. At Eagle, August gave a daily average of 53° for the 6-inch soil thermometer. The minimum surface temperature during June, July, and August was 25 in August at Eagle, 27 in June at Fort Yukon, and 24 in June at Holy Cross. These minimum temperatures may seem adverse to agricultural success, but the cold was of exceeding brief duration, the soil was warm, and the sun shone almost throughout the twenty-four hours, and the frost though sharp was not killing. Further, it is to be remembered that the points named are most exposed, that Eagle is in the foothills, Fort Yukon within the Arctic Circle, and Holy Cross is subject to the cooling influence of Bering Sea. In other words, the places named are not selected and not the best suited for agriculture.

FIRST EXPERIMENTS MADE.

Naturally the first experiments have been made along "the main traveled road," the great waterway, and while even there the experiments are pregnant with promise, it is in the smaller valleys of the larger affluents of the Yukon that, I believe, the richest future lies. On the verge of the Yukon itself the winds blow up or down according to the season, but in the smaller valleys the wind is still or milder, and the vegetation more luxuriant. This is true of the streams to the north, but much more so of those to the south. Professor Georgeson tells of a great natural meadow some 20 miles long by 4 or 5 wide within the Arctic Circle east of the Koyukuk, and I have been told by reliable persons of a similar meadow on the Dall River. South of the Yukon lies the great valley of the Tanana, which is nearly as long as and has a valley that is wider in places than the Connecticut, the Hudson, or the Sacramento. It rises in the Alaskan coast range and enters the Yukon at Fort Gibbon, 80 miles west of Rampart, and nearly midway between St. Michael and Dawson. In the last half of May, 1899, I made an expedition up the Minook from Rampart and over the divide into the Tanana watershed. The ice still closed the greater part of Minook, and snow was on the ground and the air chill. On crossing the divide the scene shifted. The air was as mild as possible; the redtop grass was as high as my shoulder; lupines and vetches were in bloom, and berries and flowers of many kinds. The creeks were all open, and the season seemed two months ahead of the Yukon. In 1900 the Yukon broke up at Rampart in the third week of May, while the Tanana broke the second week in April. During winter rain never falls in the Yukon. On the Tanana it rained, to my knowledge, in December, 1899, and in January, 1901. It is in this valley that I believe agriculture and stock raising will be found most practicable. Speaking of stock raising, Captain Abercrombie, of the Army, lost a horse in the Tanana Valley in the fall of 1898 and found it well and hearty in the spring of 1899, and a miner named Green, who worked for me last winter, had the same experience in the winter of 1900. At Holy Cross they have a herd of five cattle, four of which are native born, and all are well nourished on native grasses, while horses have wintered and worked all winter on mixed feed and native hay during the past four years at Eagle, Circle, Rampart, and Fort Gibbon. I owned a cayuse which was worked hard all winter, had no covering for protection in the coldest of weather, and is fat and hearty to-day, although the thermometers all failed to

register the extreme cold of last winter, which was estimated at 70° to 80° below zero.

The summer months are rainless, or nearly so, but the soil is moist and cool, while the nights are bright and warm, a condition that is most favorable to steady plant growth. I see no good reasons why carefully selected seeds should not be found that will be adapted to the climatic conditions. In fact, so far as known the climate does not affect the seeds adversely and the winter does not kill them. While the temperatures that I have noted above are average, it must be remembered that the heat during the day in the direct rays of the sun is intense. On July 4, 1900, I noted the thermometer at the Alaska Commercial Company's store at Rampart to be 110°, while this year at Nulato on July 24, at midday on the river, it was 117°, and I have noted above that Dr. Dall found it at 112° at Fort Yukon. With temperatures like these it is reasonable to assume that the climatic conditions of a great part of the Yukon watershed will surely be found favorable to the growth of rapidly maturing, hardy cereals.

That the soil of the Yukon in itself should be capable of producing almost any useful article of vegetable food should be obvious to even a careless observer. Few seem to remember that the great river heads in the Rocky Mountain range; that the Pelly, the MacMillan, the Stewart, and the Porcupine are to the west side of the range what the Milk, the Yellowstone, or the Missouri are to the east side; that the same influences which have carried vast volumes of silt to form the richest alluvial valleys in the United States have operated similarly on both sides, and that the rocks whose decomposition have led to forming the alluvium are the same in the case of the Yukon as in that of the Mississippi; that the volume of the Yukon is greater than that of the "Father of Waters," and that the deposit of the sediment is made in the same way. There can be and is no real question as to the richness of the soil of the Yukon Valley. The only question of importance is, "What can it be made to grow?"

FACTS, NOT FANCIES.

The proof of the pudding is in the eating, and I propose to recite briefly what has been done, basing my statements on those of Professor Georgeson, special agent of the United States Department of Agriculture, and on my own observation, which both complements and supplements that of Professor Georgeson, as I have been over the same ground on the Yukon that he has been, and more. The statements are supported by photographs, which are the first yet taken and made public of the work of the United States agricultural experiment station at Rampart, and of the work of the Jesuit Fathers at their Holy Cross Mission at Koserefsky, on the Yukon. The photographs were taken at Rampart on July 13 and at Holy Cross on July 28, 1901.

Dawson, the best known point on the Yukon, the capital of the well-known Klondike region, is, of course, in Canada. It is well up in the foothills, and has an elevation, I believe, of 2,000 feet above sea level, yet I have seen in Dawson, at their chamber of commerce, fine samples of ripe barley and oats, which Professor Georgeson also saw, and I was told that wheat had been ripened on the Klondike River itself. At Fortymile, near the border, I was told by so many different persons, some of whom I know to be credible witnesses, that I believed them, that an old settler named Patch, so long ago as 1891, raised potatoes for sale, and also had matured samples of wheat and oats. At Eagle this summer, in June, I saw barley and oats growing. Professor Georgeson saw them headed out on July 6, 1900, and later received ripe seed and a head of ripe wheat as well. At Eagle, as at nearly every other point on the river, the Jesuits have fine root crops, growing potatoes, turnips, cabbages, and cauliflower, beside what the Yankees used to call "garden sass," lettuce, radishes, cress, and the like. Circle City was founded ten years ago, and while the country round about is wet, oats have ripened there for at least three years. At

Rampart, in 1895 and 1896, a Norse miner named Peterson, who died last winter, raised cabbage and potatoes successfully on what is now a mining claim on Little Minook Creek, a tributary of the Big Minook, which enters the Yukon at this point. In the summer of 1900 there were several successful gardens at Rampart. Last year Professor Georgeson established an experiment station with Mr. Isaac Jones, a graduate of the Kansas Agricultural College. Single handed, and with mattock and spade alone, Mr. Jones cleared the ground, stripping the moss and grubbing roots from about a half an acre, which was planted with wheat, rye, oats, barley, buckwheat, turnips, and potatoes.

RABBITS DAMAGE CROPS.

Rabbits caused some damage to his crops, but the way they looked on July 13 of this year may be seen in the photographs better than from description. It should be said that the most successful growth was of rye, which was seeded from a few heads of ripe volunteer grain found by Mr. Jones on August 15 of last year, growing in the rear of the North American Transportation and Trading Company's store at Rampart, where the seed had evidently been dropped the season previous from a sack of feed. All this grain was sown in the fall, and as last winter was the severest known on the Yukon, it is evident that seed at least will survive the hardships of a Yukon winter. Mr. Jones's poorest crop was Siberian buckwheat, sown from seed supplied by the United States Department of Agriculture. Some buckwheat of unknown origin did much better, and both were in flower when I took the photographs. The rye, barley, and oats made a fine stand, but wheat was not well on. The soil at this point was a clay loam, with some sand, located about a furlong from the present river bank. The grain was far enough along to indicate that it would be ripe before the hard frosts would naturally set in. At Fort Gibbon, at the mouth of the Tanana, on the north fork of the Yukon, Mr. Georgeson saw and picked oats that were ripe on August 4, 1900. They were part of a patch of volunteers, most of which had been eaten down by the cattle of the fort, but had headed out in second growth and were in bloom. At Holy Cross Mission the Jesuit Fathers, under Father Raphael J. Crimont, a learned, accurate, painstaking, and systematic worker, have made greater progress in farming than at any other point. They have a herd of cattle, all but one native born, fed wholly on native grasses. There are over 3 acres in garden and grain this year. On this they have raised over 500 bushels of Early Rose potatoes on less than two acres. Most of the potatoes are small and not mealy, but they are good, and the largest weighed 17 ounces. They have raised turnips weighing $8\frac{1}{2}$ pounds, and beets and carrots weighing over $\frac{3}{4}$ of a pound each. This year, for the first time, they planted grain which was supplied by Professor Georgeson, and I give photographs showing how it looked on July 28. The soil at this point is not very good, and it was prepared without suitable implements.

MOST CROPS FLOURISH.

It is true that "one swallow maketh not a summer," and there is no reason to think that the farms of the Yukon will ever rival the bonanza wheat fields of Dakota; but it is equally true that wheat, oats, rye, and barley have ripened and produced mature seed at different points during several years under the most adverse circumstances on the Yukon. It is also true beyond peradventure that most crops and nearly all garden vegetables grow to perfection wherever the ground is scratched, and that currants, raspberries, gooseberries, cranberries, huckleberries, and many other native small fruits do exceptionally well. It seems reasonable to conclude, therefore, that time and attention will show that ordinary agricultural operations can be carried on successfully, more so than anyone would have believed four years ago, and more than the great American public yet realizes. It will amaze most people

even now to learn that the careful estimate of Professor Georgeson, the Agricultural Department's expert, who has personally been over the ground, is that Alaska contains 100,000 square miles of tillable and pasture land and that "it is chiefly the vast region in the interior" which will furnish the agricultural land. In this estimate I believe he is correct. I have spent much more time than he has in the country, have traveled the river from source to mouth, and have made it a point to question the majority of the miners and explorers whom I have met, certainly at least a thousand and probably more during four years, men who have been on nearly every creek and river of the Yukon watershed, the Porcupine, Koyukuk, Tanana, White, Shageluk, Melozi, Novi, Dall, Chandeure, Chena, Nenana, Ozanna, and others, some not yet mapped, and while neither their testimony nor mine is expert, and while some were skeptical, by far the greater number believe that some day the Yukon valleys will be settled by small farmers, particularly by the sturdy Norsemen, men who as Professor Georgeson suggests, "possess the courage to face and sufficient energy and strength to endure the hardships incident to pioneer life in a northern climate, who can clear and till the land with their own hands." Such men, who do not look for a market, but for a home where they can support themselves in independence, will eventually find it in the Yukon Valley, where by a little farming, some fishing and hunting, and some mining they may be happier and more comfortable than they are now. In fact, there are a very few such persons there now. I know personally an Englishman and his wife who have located a farm on which they are already self-supporting and where they expect to end their days.

I have mentioned fishing as incidental to farming, for the wealth of fish in the streams is almost incredible even to a resident of Puget Sound, where the salmon canning industry is so vast. As an indication of what it is I give a photograph of salmon drying at one Indian village, Nulato, where the fish are caught by the most primitive methods. I have mentioned none of the drawbacks, for they are only those incidental to pioneering. Isolation, cold, and insect pests, mosquitoes, and gnats. These are bad, but I believe they are no worse than the Pilgrim Fathers found when they first landed on the "stern and rock-bound coasts" of New England. There the cold was more intense because it was damp, the mosquito plague at first as bad, and the isolation greater, because the Pilgrims were months from civilization where the Yukon pioneers will be weeks, while with the Government telegraph line now building completed they will not be days from touch with the rest of the world.

EDITORIAL COMMENTS.

The same issue of the Post-Intelligencer which contained the foregoing article by Mr. Brainerd, namely, that of September 29, 1901, contained also an editorial on the general subject of agriculture in Alaska, which I submit because it shows that the leavening forces of investigation and education are at work and because it aims at the correction of misleading conclusions, drawn from faulty premises, but which have been widely disseminated throughout the country. The fact that but few men make their living in Alaska by agriculture at present should not be taken as proof that the country has no agricultural possibilities. The editorial is as follows:

The publication of a little bulletin by the Census Bureau, dealing with agriculture in Alaska, has led to an amazing amount of uninformed comment by newspapers of the country. One would have supposed that even the most careless newspaper writer would know that census investigations deal with facts as they are and not with facts that may or may not exist hereafter. One would not expect the statistics

of an undeveloped industry in an undeveloped country to be taken up and commented upon as a measure of that country's capabilities and a statement of its limitations in that especial direction. Yet that is just what has happened.

The same dogmatism of ignorance that once condemned the central spaces of this continent, now the home of millions of thriving people, to desolation, tells us that farming can not be carried on in Alaska.

We have taken occasion several times to correct the ludicrous but injurious conception of Alaska's future thus set before the people by agencies to which they are accustomed to trust for facts. We have, in particular, pointed out the conditions of climate along the already well-known coast region of Alaska, the modifications produced by the warm Japan current, and the certainty of profitable returns on agricultural industry there wherever there are reaches of lowlands suitable for cultivation. But it will be novel to most of our own readers to hear that the agricultural possibilities of interior Alaska, especially of the valley of the Yukon and its tributaries, are even greater than those of other sections. For here we have the splendid alluvial soil that characterizes the river bottoms of our own mountain regions, while the climate is such that almost all the products of the north temperate zone may be raised there with certainty and in abundance.

This fact is set forth in an extremely interesting and valuable article by Mr. Erastus Brainerd, which appears elsewhere in this issue. Mr. Brainerd is not talking theory, but fact. He is a man who sees things as they are and understands what he sees. He writes of a country with which he is personally familiar. He tells what has actually been done as well as what is possible. And his statements are reenforced by a series of photographs, taken on the spot, which may convey a few new conceptions to those in the East who have formed their ideas of Alaska from a view of the Muir glacier.

Mr. Brainerd says: "Wheat, oats, rye, and barley have ripened and produced mature seed at different points during several years under the most adverse circumstances on the Yukon." He says that most crops, and nearly all the vegetables, with small fruits, grow in the greatest profusion with but little care, while there is no question of the value of the section as a stock-producing country. This is substantiated by the facts of past experience, and is to be considered in connection with the estimate of an expert of the Agricultural Department, that there are at least 100,000 square miles of tillable and pasture land in Alaska, chiefly in the interior.

The analogy of other countries lying as far north as the Yukon, or farther, referred to by Mr. Brainerd, makes the estimate of Alaska's future agriculture primarily reasonable. Its possibilities rest mainly on two conditions which are entirely overlooked by those who have never lived beyond the lower latitudes. One of these is the high summer temperature, the other the length of the summer day. The attention of the outsider is directed wholly to the excessive cold of the Alaskan winter. He hears of 70° and 80° below zero, and forthwith assumes that the thermometer barely rises above the freezing point in summer. The fact is that a temperature of over 100 is not uncommon, while the average for the short summer is high.

We say "short summer," but that needs qualification. It is short in months and days, but long in hours. When the sun is farthest north, there is, in those latitudes, a period of but from two or three to five or six hours of twilight. Plant life, looking for light and heat, gets as much of them in two months of these lengthened days as it does in four months of the days farther from the Arctic Circle. The working of the law is perfectly familiar to the farmers of Minnesota and the Dakotas, where cereals mature in much less time than farther south. The Alaskan valley, during the brief warm term, is a veritable hothouse, where vegetable growth proceeds by a forcing process to results impossible elsewhere in the same length of time.

All the circumstances, all the experience of men elsewhere, as well as in the few spots of Alaska which the hunt for gold has permitted to be devoted to agricultural

uses, all the well-known physical laws of the seasons and of the germination and development of plants, point unmistakably to the conclusion that Alaska will one day support a large population engaged in tilling the soil and in the care of herds. It may take long to develop, but the immigration induced by gold discoveries will hasten it wonderfully. Meanwhile it is important, and it is just that a true idea of Alaska should be set before the people instead of that which ignorance and superficialism have caused to prevail, even among intelligent men.

REPORT OF ISAAC JONES ON THE RECONNOISSANCE OF THE INTERIOR ALONG THE TRAIL FROM EAGLE TO VALDEZ.

The following report on that portion of Alaska bordering on the mail and Government trails between Eagle and Valdez is respectfully submitted:

I started from Eagle on the morning of September 10 in company with Mr. Oscar Fish, the mail contractor, and one of his carriers, Mr. Al. Paxton. The trail, which is simply a more or less well-marked footpath along which pack animals may be taken, leads off in a south-westerly direction from Eagle to the ridge, which on one side is drained by the Fortynile system, and on the other by tributaries of American and Mission creeks.

The trail here is very good as Alaskan trails are considered. On the lowlands and through the timber the soil is somewhat sandy in character and fairly well drained. Trees that would have interfered in using pack animals have been removed, and it is only where there is a very considerable depth of moss that the trail is wet and at all trying on horses. On the higher ground the trail has very much the appearance of the buffalo paths that used to be so common in the prairie States. It is beaten well below the general level, and has the characteristic windings where there seems to be no good reason why it should not have continued in a straight course.

For 25 miles from Eagle the entire country is broken by small creeks, separated from one another by steep ridges. These streams have, as a rule, very narrow valleys. The hillsides are steep, and in nearly all cases the foot of the incline is close to the stream. In places, the higher ground spreads out in a sort of table-land half or three-fourths of a mile wide; but generally the distance across is not nearly so great, and in some places the ridge is sharp and stony. This hill country is said to have an elevation of from 2,000 to 3,000 feet. The soil in places is a clay loam, usually wet, but more often it is made up of disintegrated granite or slate, and in this section good-sized pieces of the rock are much in evidence.

This portion of Alaska has little to commend it to the agriculturist except perhaps as a grazing country. In general, there is a heavy coat of moss on the surface, but in some places a native grass (commonly called redtop) has asserted itself and would furnish considerable feed for stock.

Throughout this section trees of spruce, birch, alder, poplar, and several varieties of willow constitute the timber growth, spruce and birch being more common than the other kinds. Spruce and alder make rather dense growths on the lower lands, and a spruce tree 14 inches in diameter at the butt is not uncommon. Specimens of alder 25 feet high, and with a 4-inch diameter at the ground can be found all along the streams.

Poplar and birch are commonly found on the sidehills, where the growth is somewhat sparse. Six inches is probably above the average diameter for birch, and the largest poplars in this section have no more than a 10-inch diameter, though in other places trees of this species 20 inches in diameter may be found. In general the lower portions of the hillsides are heavily timbered; the growth becoming less dense as you reach higher ground. The timber land is usually about two-thirds the distance from the creek bed to the hilltops, varying as the slope is north or south. Dwarf birch is common on the highest levels, and patches of scrub willow may be found on very high land. On the highest elevations these dwarfs are very little taller than the bushes of blueberry (*Vaccinium canadense*), which are very common and which bear abundantly. Cranberries (*Vaccinium oxycoccus*) and bear berries (*Arctostaphylos uva-ursi*) are also very common at this season, and may be found at any point from the creek bed to the summits of the highest hills.

At a point about 25 miles from Eagle the trail leads downward, and for several miles passes over a gradual slope which extends from the high ground to the bed of Liberty Creek and as far up and down stream as one can see from the trail. There is about 30 square miles of land here that from the slope of the surface and the character of the soil should be considered very desirable for farming. The slope faces the southwest, hence has a good exposure to the sun. A portion of this slope has been burned over in recent years, and on the land thus cleared of moss very fine native redtop was growing. On patches here and there the stand of grass was thick enough to yield a good crop of hay, and the entire slope would supply good pasturage for live stock.

The soil of this slope is a sandy loam, well drained and generally of good depth, though occasional gravel spots may be found. Portions of the slope are covered by a dense growth of young spruce trees 4-6 inches in diameter. In other parts the timber is sparse. There are few growing trees of large size, but many large trees that were killed by fire a number of years ago may be seen.

The land rises quickly on the south side of Liberty Creek, and after about five hours' travel over hill country we pass to the left of a landmark of note called "The Dome." This elevation is hemispherical in form, and with a very regular outline, considering that the rock

belongs to the slate family. It rises high above the surrounding country, and has an altitude of 4,600 feet. "The Dome" is used as a sort of official guide for travelers through this portion of Alaska, and trails to different sections intersect close to its base. Our camp on the evening of September 11 was close to the "The Dome," and some 35 miles from Eagle.

On the morning of September 12 two of our horses were missing. Several hours' search failed to find them, and Mr. Paxton remained to continue the search, while Mr. Fish and myself proceeded on toward Fortymile. The trail led over a hill country, but the slopes were in general less steep than the hillsides north and east of "The Dome." The slopes here are covered with heavy spruce timber almost to the hilltops, and the trees of poplar are also of good size.

On the evening of the 12th we crossed the Fortymile and stopped at "Pete's Place," at the mouth of Steele Creek. There is no extent of valley to the Fortymile at this point. The banks rise high and rocky above the stream. This flat is closely shut in by high land on all sides, and is seemingly not well placed for a garden spot, but the persons that had planted garden seeds were well pleased with the result. I saw a patch of very good oats that had grown in one of these gardens. The seed was sown in June and it stood 3 feet 6 inches high with well-filled heads of fully matured grain when I saw it in September. We are now in the gold-bearing section of the Fortymile system, though no great amount of gold has been taken from Steele Creek.

On the morning of the 13th a heavy fog prevented one from observing any extent of territory. The mail trail runs somewhat parallel to and above "Jack Wade Creek" for some distance, the creek being on our left and the trail going toward its source. The miners travel the mail trail to and from Steele Creek, and it has happened that travelers who did not know the country have made the turn off to the left into Jack Wade Creek, instead of keeping the main trail toward Franklin Gulch.

Jack Wade Creek and Franklin Gulch are both gold producing, the output each year being considerable. There is no land through this section that would appeal to an agriculturist. The hilltops are stony, the sides are somewhat boggy, and, as far as I could judge, the timber is not good. Mr. Fish has a relay station (a place where horses are changed and provisions secured) at Franklin Gulch, and the carrier who handles the mail between Franklin Gulch and the Tanana station was our traveling companion until we reached the latter place, some several days later.

The mail man is welcomed in all portions of Alaska, and Franklin Gulch is no exception to the rule. Men from the lower claims come to the mouth of the creek in hope of receiving mail or to hear the latest news from the "outside," the mail to be delivered en route

being carried outside the sack. Here I met Mr. John Martin, a pioneer of Franklin Gulch, who is noted throughout the Fortymile country for his hospitality.

The South Fork at Franklin Gulch is neither as deep nor as swift as the main stream of the Fortymile. At Steele Creek we and our goods were ferried across, the horses swimming the stream; but here the horses could wade without difficulty.

Leaving Franklin Gulch on the morning of September 14, we traveled in a southwest direction toward the Upper South Fork. The change in direction of the South Fork, from a northeast to a straight north course, occurs several miles above Franklin Gulch at a point where Walkers Fork comes into the South Fork. From the high points on the trail we could see that above this junction of Walker's and South Fork both of these streams flow through comparatively wide valleys. Along each of these streams is a considerable strip of grass land, close to the stream. In general the grass is distributed on both banks, but it may be mostly on one side or the other, according to the winding of the stream across the valley. These strips of grass land, not more than a quarter of a mile across at the lower end, widen with the valley as you go upstream. After about 10 miles of hill lands the trail leads to a somewhat low rolling country, with gradual slopes. There is a dark sandy loam here, some three inches deep, with a clay subsoil that prevents good drainage, and in consequence there is much water on the surface. This is a good grazing country. The timber, which is mostly spruce and of good size, is not of dense growth.

During the afternoon we passed close to a bend of the South Fork, which is on our left, and for some distance through a very fine patch of redtop, growing close to the stream.

On the evening of the 14th we crossed a small stream called Gold Creek, and stopped for the night at the mail cabin at this place. Gold Creek flows through a valley, the soil of which is largely made up of disintegrated granite. Creek gravel is found in different places on the lower land, an indication that the stream is not always confined within the low banks. Very fine specimens of spruce and cottonwood are growing here. The mail cabin, which is roomy and well made, was built for Mr. Fish by an Indian.

Next morning, the 15th, we traveled for several miles over a somewhat heavily timbered country, mostly spruce, and having a limestone soil. About 10 a. m. we passed from the timber to a grass covered level plain, having a sandy soil. The grass land is about 8 miles across at this point, increasing in width as you go upstream of South Fork of the Fortymile. There are some small patches of "nigger heads" (bunches of swamp grass which year by year form a compact tuft of roots that is several inches above the original level), but

most of the land is well drained, and on this a heavy crop of native grass was growing. Our stop for lunch was at the Indian village of Ketchumstock. This village is located well out in the grass country, and away from all timber. The town is divided by Ketchumstock Creek, which runs southeast into South Fork, and is used as a means for transporting firewood and house logs for the village. The Indians in this tribe are somewhat lighter in complexion than the Yukon Indians, and some of the older men wear long, rather heavy beards. The chief takes great pride in an American flag, which floats from a very respectable flag pole while visitors are at the village. These Indians do not appear to be particularly resourceful, though cabins recently built are a decided improvement over the older buildings in the village. They cross the stream that flows through the village by means of a rude raft. The stream is neither wide nor deep, and could easily be bridged. That the raft does not handle easily, and that it does not always carry the passenger safely to the opposite bank of the stream was, I think, very forcibly impressed upon the mind of a certain member of our party, who got a cold bath while crossing.

In the timber that skirts this grass land the Indians have built a fence that represents considerable time and labor. I have been told that there is over 60 miles of this fence, which is about 6 feet high, and which somewhat resembles the worm fence of certain sections in the States. The fence is built by first laying a row of poles on the ground and then driving stakes on both sides in a slanting position, so that they will rest on and cross above the pole used as the bedpiece for the fence. The forks thus formed are tied with willow withes; the second pole rests in the forks. Other stakes are driven in a more upright position, so that they cross above the second pole, and so on until the fence is finished. Between the forks, if the poles are long, stays are placed in the ground in a perpendicular position, and each pole is tied to the stay. Snares are set in the openings in the fence, and many caribou are taken in this way. There are about 50 Indians in Ketchumstock. This village is located about 110 miles from Eagle and 320 miles from Valdez. During the afternoon of the 15th we continued across the flat country, part of which is very wet, but not at all muddy. We passed through some meadows over which a mowing machine would work without difficulty. On these meadow sections the grass grows tall and heavy, and the entire flat affords excellent pasturage.

Our camp on the evening of the 15th was at the Indian Creek cabin. The cabins between relay stations have been repeatedly robbed of provisions during the summer months, and for this reason we carried supplies from one relay station to the next, no supplies having been placed in the intervening cabins for the summer season. In some way the sack containing our flour, oatmeal, etc., was left outside with the

saddles, at the Indian Creek cabin, and next morning we found that the horses had made a clean sweep. For two days now, or until reaching the relay station at Tanana, bread and mush were omitted from our bill of fare.

Indian Creek is little more than a brook flowing through the grass country; there are patches of spruce timber in places along close to the banks. We crossed this stream on the morning of the 16th, and passed over some very wet country, a great deal of which is nigger-head land. There are evidences of peat formation here. In places fire has burned down 3 or 4 feet below the level; these holes usually are not more than 20 or 30 feet square, and have a soft sticky red clay at the bottom of the pit.

The dry lands between Indian River and the Mosquito Fork, which is a continuation of South Fork, and which we crossed just before noon, somewhat resemble the prairie soil of the Central States. There were patches of very heavy growth of redtop. According to the measurements of a Government party that had passed over a portion of this trail in running a line from Valdez to Eagle, the point at which we crossed the Mosquito Fork is 303 miles from Valdez.

We had a much drier trail during the afternoon of the 16th; we were gradually going up grade across a grass country dotted with patches of scrub willows and small spruce trees. Grouse were very numerous here, as they are the entire distance to Copper Center, 200 miles farther on. The surveying party had marked the distance from Valdez on at intervals of 5 miles wherever a tree could be found for a mile post, and these posts are looked for with interest, though it sometimes happens that one is passed without being noticed.

When we reached the cabin at Wolf Creek on the evening of the 16th we had practically crossed the Ketchumstock Flats. I estimate that there are at least 750,000 acres of excellent grazing country in the valley of the Upper South Fork and its tributaries. About half of this area is sparsely timbered, but is still good grazing land. One can obtain a good idea of the extent of the grass lands from a point a little north and east of Indian Creek; from here the treeless region stretches out for miles in all directions, and seemingly well up the sides of the low hills that almost surround it.

Much of this land could be brought under cultivation as easily as prairie lands of the Middle West. As a money making proposition there is no inducement for one to try farming in this section at the present time; there is no mining camp of importance near, and there would be no market for surplus products. Game is plentiful, however, and the man in whom the spirit of the old pioneer is found might be well pleased with the life he might live here by combining farming, hunting, and prospecting for gold or other minerals. Again, I think stock might be raised here at a very considerable profit; any desired

quantity of hay could be put up for the winter use, and when ready for market the animals could be driven to Dawson or Eagle and shipped in barges to points along the lower river. Perhaps the easiest route to this section at the present time would be from Fortymile Post up the Fortymile trail to Steele Creek and then over the trail we traveled.

Horses have lived through the winter in this grass section on more than one occasion. A Mr. Anderson, of Steele Creek, has a black horse that was taken up last spring after having spent the winter on the Ketchumstock Flats. The Indians told of two horses that were turned loose by a Mr. Holeman in the fall of 1899. These animals have passed two winters in this section, and were seen a few miles from the trail two days before we passed the village.

On the morning of September 17 our path was one of ups and downs, each succeeding grade taking us to greater heights. Just before noon we reached the summit of the divide between the Forty-mile and the Tanana Rivers, and we ate lunch some distance down on the Tanana side. Judging from the vegetation, frosts are several days earlier on the Yukon than on the Tanana side of the divide.

Before leaving Eagle I noticed that the leaves of the cottonwood, birch, and alder were highly colored, and had begun to fall. On the Tanana side the leaves of these trees were still green. None of the vegetation showed the least injury from frost. I gathered some very good raspberries here; the berries had evidently been ripe for some time, and though the flavor was good it would have been better had the berries been gathered at an earlier date. The raspberries here differ somewhat from those on the Yukon. Here the bush stands erect and tall, and the berries do not drop immediately after ripening, which is the case with the Yukon variety, the bushes of which do not make an erect growth. Good specimens of spruce and cottonwood are growing well up toward the summit on the Tanana side, the growth being dense in places.

The slope on the Tanana side is much steeper than that on the Forty-mile side of the divide. Early in the afternoon we reached the lowlands of the Tanana Valley. For 6 miles the ground is deeply moss covered, and small patches of nigger-head land are passed over. The timber is only fair until we approach Lake Mansfield, where the individual trees are large. This lake is a beautiful body of water, circular in outline, and about $3\frac{1}{2}$ miles in diameter, and having a sandy shore. Water fowls were plentiful and the lake is said to be well stocked with fish. The Indians set traps in the outlet, on the south side of the lake, and large numbers of white-fish are taken in this manner. The salmon does not get up this far. From Lake Mansfield to the station on the Tanana, a distance of 8 miles, the soil is a brown sandy loam, with a sandy subsoil. In general the timber growth is not dense,

though large trees are plentiful, and there are some patches of dense young growth. Close to the river the timber is very good.

There is some good hay land here. I saw some excellent hay that was put up for the mail horses by Mr. Charles Overheiser, who had been in charge of the Fish Brothers' trading station at the Tanana. Grass has not taken this section as it has taken the ground in the Fortymile country, or as it is said to have taken the land lower down on the Tanana. Straggling bunches of grass are found all over the valley. A very thin coat of moss covers the ground, and blueberry bushes make up the undergrowth for a great part of this section.

There are two large log buildings at the Tanana, both belonging to Fish Brothers. One is used as a warehouse and general store, and the other, which was not finished when we passed, will be used as a road house. At present there are no other buildings at this point. The goods for the store are hauled from Fortymile Post on the Yukon during the winter. Next season an attempt will be made to get a small steamer to this point, some 350 miles from its junction with the Yukon. At the Tanana station we are 265 miles from Valdez, and about 170 miles from Eagle. There is a free ferry at this point, which is looked after by the man in charge at the station. This ferry is a great convenience to prospectors or others that pass this way during the summer months. Of course the horses have to swim the stream, which is said to be 500 feet wide at this point, but the boat enables the traveler to keep himself and his outfit dry while making the crossing.

There is a large stretch of almost perfectly level land on the south side of the Tanana. The soil is a dark sandy loam and the subsoil is sandy. I made a reservation of a square mile on the south side of the river, the northwest corner being close to the river, and near the Government trail, which has been cleared of brush to the Tanana. As far as one can see up or down stream from this point, probably 15 miles in each direction, there is no closing in of the valley, and it is at least 20 miles wide here. A large area in this portion of the valley was burned over some years ago. But outside this burnt area, where timber is still alive, there is no underbrush to speak of and the timber generally is small and somewhat scattering.

This land can be brought under cultivation with little difficulty. It is possible, however, that the rainfall in summer is not sufficient for growing crops. The sandy nature of the soil would prevent its retaining moisture for long periods. I was unable to obtain definite information as to the rainfall, but I am satisfied that, barring dry weather, farming may be carried on successfully in the valley of the Tanana. As in the Ketchumstock country, there would be no market for farm products at the present time.

Captain Abercrombie's force of trail makers had reached the Tanana, and turned back a few days before we reached this point. Trail build-

ing across the valley of the Tanana is comparatively easy, as all one need do is to remove the windfalls that may lie across the proposed road, and in some places standing timber has to be removed also in order to get the required width, 12 feet, for the trail. Before reaching the Tanana Valley the task of the trail makers was not an easy one, but the capable manner in which the difficulties that presented themselves were surmounted showed that the men understood their work.

Leaving the Tanana Valley, our course is up the valley of the Tok, in the direction of Mantasta Pass. This valley is several miles wide, and has in places a clay soil very wet. In other parts the valley is stony. There is no agricultural land here, but there are some beautiful specimens of spruce and cottonwood. In crossing the Tok at a point where it seemed necessary to partly unpack the horses, the water being deep and swift, another member of our party had reason to know that Indian rafts are not a safe means of transportation for one unskilled in handling them. When we reached Mantasta cabin on the evening of the 19th, we had crossed, or were then at the summit of, the pass. The lake which lies just south of the cabin is stocked with fish from the Slana River, a tributary of the Copper River. The grade from the valley of the Tanana to this point has been so gradual that it is difficult for one to believe that he has reached the highest point on the trail, between the Tanana and Copper River valleys. Sharp-pointed peaks that rise to a great elevation on each side of the pass convince one that the trail from the coast to the Yukon would have been a difficult one had not nature provided this pass. At Mantasta cabin we found the trail builders; they were camped here for the night. They had no grain for their horses, and were compelled to travel by short stages so that the horses might have more time to feed.

On the morning of the 20th our trail was rocky, in the literal sense, taking us over several miles of cobblestones of granite. Early in the afternoon of the 20th, we reached a point from which the broad valley of the Copper River could be seen, and towards the evening of the same day we saw the stream itself off to the left. We camped outdoors on the bare ground, not having a tent, on the night of the 20th. The mail cabin is some two miles from the Government trail. During the afternoon of the 20th, and all day until the evening of the 21st, we traveled over a slightly rolling country, which was deeply covered with moss, and upon which the timber, mostly spruce, was of small size except close to the streams, and not of dense growth anywhere. Through this section there are many small lakes having small streams as outlets. Nigger-head land is also very common here, and there are certainly many areas of considerable size in Alaska in which agricultural possibilities are more favorable.

The Chestoehena River near the mouth spreads out in several channels, over a very wide bed. These shallow channels are constantly

changing, as are also the channels of the Copper, which spread over a wide river bed at this point. The relay mail station is on the south side of the Chestochena River, close to the bank of the Copper, and at the junction of these two rivers. This point is on the route from Valdez to the gold diggings at the headwaters of the Chestochena, some 60 miles to the northwest, and the mail contractors maintain a trading post in connection with the relay station, with Mr. Harry Fane, who also acts as mail carrier between the Tanana station and this point, in charge. This station is 160 miles from Valdez.

South of the Chestochena station the soil has a depth greater than that on the north side of the pass, and here the valley of the Copper is largely made up of broad level benches, that rise one above another as one goes back from the river. Some of these benches are somewhat sandy and probably would be rather dry during the summer months; others would retain moisture for a long period. Prospectors speak with enthusiasm of fine farming lands toward the headwaters of the Gakona and Tazlena rivers, and there is good land near the mouth of each of these streams.

The Gakona is some 200 feet wide, and is crossed by a ferry for men and goods, while horses have to swim. This is a difficult stream to cross, on account of rocks and rapid water. People have been drowned in attempting the crossing.

The Tazlena, the next stream of importance, is easy to ford except in time of high water. From this stream into Copper Center, a distance of 12 miles, there is an especially favorable section from an agricultural standpoint. The land stretches back from the river in level benches, and the soil is a dark rich-looking loam. A good portion of the tract has been burned over the past season and could be cleared easily. There are some large trees, but the timber is mostly small. It is impossible to say how much good land there is in the Copper River Valley. From my hurried trip I have no definite knowledge of the land except that along the trail, but from what I saw, and from the opinions of others that I met and talked to, there is certainly a very large area in the Copper River Valley that is all one could wish for in soil and exposure from the standpoint of the agriculturist. People throughout this section quite generally believe that there is an agricultural future for the Copper River Valley.

At Chestochena station agriculture in Alaska was being discussed, when two old miners who formerly worked in the upper Sacramento district in California entered the cabin. One of them immediately expressed the opinion that the first man who came into the country to farm should be hanged. He blamed the farmers of the Sacramento Valley for the closing of the hydraulic mines on the upper part of that river, and he seemed to imagine that farming in Alaska would be detrimental to the mining interests of the Territory. The same man spoke highly of the upper valley of the Gakona River as a farming country.

About half a mile northwest of Copper Center, near the Government trail, is the southeast corner of a tract of land a mile square that I staked and reserved for an agricultural experiment station by posting a notice on this corner stake.

At Copper Center Mr. Davis, the proprietor of the hotel, showed me some grain that had been grown in the garden of a Mr. Holeman, who formerly was in the hotel business here, and who has settled on 80 acres of land upon which the town is now built. Of this grain oats made a fine showing, there being 3 feet 9 inches of straw, with well filled heads of fully matured grain. Rye stood 6 feet 2 inches high, but the grain though fully formed had been damaged somewhat by the recent frosts. The wheat showed a fine stand of tall strong straw, the grain being in much the same condition as that of the rye. These grains were sown between the first and the middle of June, and would all have made excellent feed. I am told that seeding may begin here early in May, in which case spring rye and wheat will mature, and certainly fall wheat and rye, as well as barley and oats, will mature perfectly. I also saw some grains that were sown rather late in June by one of Captain Abercrombie's men from seed furnished by the Sitka Experiment Station. They were similar to those grown in the garden of Mr. Holeman as regards maturity.

I spent the 23d day of September looking over the surroundings of Copper Center, and I am satisfied that in many respects it is one of the best locations for an experiment station that I have seen. The soil is fertile, can be cleared and worked easily, most of the ground having recently been burned over, and, if I have been informed correctly, there are no frosts in the summer months, and the land is typical of large areas in the Copper River Valley. A station here might be beneficial to the natives of this section; they are not a progressive race and they are the least resourceful of the Indians in Alaska that I have seen. From a physical standpoint they are not the equals of the Indians on the coast or the Yukon Indians; nor are they anything like as progressive. Many of them still live in shelters covered with bark, and their methods of fishing are decidedly crude. The apparatus for taking the fish is a willow basket fastened to a spruce pole. The fisherman walks out on a rude platform, which extends over the stream, and he uses his basket as a dip net. Fish is the principal food of these people, and when the salmon run is light, the indifferent catch that may be made with the basket nets is not sufficient to keep hunger from the camp during the winter. Large game is becoming scarce, and each day the Indians' chances for making a living become less. They seem willing to help themselves if shown how, and it may be that they will plant gardens if they could see that a benefit was to be derived from so doing. If something is not done for them, the Indians of the Copper River will soon have passed away.

There are difficulties in the way of establishing an agricultural

experiment station at Copper Center. The settlement is 103 miles from Valdez, and supplies would have to be taken in overland from the coast in the early spring when prospectors are going into the diggings. The trail would then be good most of the way; but on the summit and on the Valdez side storms are apt to occur at any time, and they sometimes block travel for days. Farm implements would of necessity have to be hauled to the station before the snow goes off. Provisions, of course, can be packed in at any time; but this is expensive. During the past summer season 50 cents a pound was paid for packing goods from Valdez to Copper Center.

Early on the morning of the 24th we again started toward Valdez, 103 miles distant as the Government trail runs. We crossed the Klutena River near Copper Center, over a bridge built by the trail-makers. This bridge is similar in construction to other bridges which span the streams between here and Valdez. Cribs are put in place lengthwise of the stream, one in the center and one on each side of the stream. Bed pieces are placed on these cribs and the bridge is well braced above. The floor is made of poles about 4 inches in diameter. After crossing the Klutena bridge, we turned to the left and followed the bank of the Copper for several miles. A new trail was being opened when we passed along. It joins the original trail above Tonsena Lake, and is built to avoid the swampy land between Copper Center and this lake. Leaving the Copper River bank, we passed over some 5 or 6 miles of heavily timbered country; the moss was not deep here and the soil was well drained and rich-looking, dark in color, with just enough sand to work up easily. The size of the trees would make clearing costly as compared with the amount of labor it would require to clear the land near Copper Center. Grass was growing in scattered bunches through the woods, but there were no patches of any size. About noon we passed close to a lake where the trail men were working, and we had to make our way through the woods to the old trail as best we could, and the task was none too easy. The timber was dense, and chopping was necessary in places in order to get the pack animals through. The day was cloudy, which made it difficult to keep the direction, and the situation was made more confusing by trees that were blazed in a seemingly promiscuous manner, which made it difficult to follow a course in any direction. By this time it had begun to rain, and all together it looked as though we would not reach Tonsena road house by night, as we had hoped to do; but about 4 o'clock a blazed trail that it was possible to follow was discovered, and we were shortly afterwards on the Government trail again, about 6 miles from Tonsena road house. It was dark and raining heavily when we reached Tonsena. This was the only rain we had during the trip. There is a Government bridge across the river at this place.

From Tonsena the trail leads through Kimballs Pass. For several

miles from the river the trail rises gradually over a slightly rolling country having a rather light, poor-looking, and somewhat stony soil. Early in the forenoon we reached a point where snow had fallen the night before, and we had a depth of 2 inches in the pass proper. The grade on each side of the pass is gradual and the elevation is probably not more than a thousand feet above the trail.

After leaving Kimballs Pass the trail is muddy, there being a black muck or boggy soil across the Ernestine Divide, which is really a large, elevated, almost level, and mossy section, from which flow the South Fork of the Tonsena on one side and the Ernestine Creek on the other. We stopped at "The Barns" on the evening of the 25th. At this point the Government has a large barn to shelter horses which it may be desirable to keep at this place during the winter months. A member of the signal corps is in charge of the station. The telegraph line is in operation between Valdez and Copper Center and men are stationed about 25 miles apart along the line. After leaving "The Barns" our course is along the North Fork of the Tiekell River. In places this stream has a valley 2 or 3 miles wide; in other places it is closely shut in by mountains on either side. There are evidences of snow slides at various places along the trail, chiefly in the form of great bowlders that have come down with the snow during the winter season. Soon after crossing the bridge over Stewart Creek we passed up and over a considerable elevation, where the trail was steep, muddy, and somewhat stony. We were now following a mountain pass up the Chena River. Timber here was rather sparse and the trees somewhat stunted in growth. The Chena is bridged at a point where it flows in a narrow bed between perpendicular rocky banks. About a mile and a half from the bridge is station "Number Three," put up by the trail builders, and which consists of two Government buildings. One is used for a storehouse for supplies, the other is a dwelling for the signal-corps man who is stationed here. We remained at this station over night. Next morning our horses were missing, but they were finally found some 4 miles up the trail, near an old mail station, where grazing was good. At this place I saw timothy grass that stood 3 feet high. The seed had evidently been scattered from hay that had been fed to the mail horses. The elevation here is about 3,000 feet, and glaciers may be seen in a number of different directions. I counted 6, none of them distant. We had intended to make it into Valdez on the 27th, but the action of our horses delayed our start. The grade to the summit is a gradual one and the climb is not at all difficult. Near the head of Ptarmigan Creek, well up toward the summit, the land stretches with a gentle upgrade in all directions from the creek bed, and here the ground is grass-covered, the land is somewhat marshy, and the vegetation is like swamp grass in appearance. We had a fine day for crossing the summit, and the scenery, as the trail led over low

elevations, each of which we had considered would take us to the summit of the pass, was most interesting.

There is so much sameness here and such a lack of definite landmarks that it is difficult to follow the trail after snow has fallen. One is much impressed with the danger and difficulty that a traveler would encounter in crossing the summit during a storm. The summit is some 2 miles wide and is about 25 miles from Valdez. The trail down into Dutch Valley, which is a sort of basin to which the mountain sides slope in the direction of Keystone Canon, takes a somewhat winding course, but the grade is gradual. A portion of the trail had caved off, in one place leaving a narrow ledge close to the bank from the side of which the trail had been cut. There was room on this ledge for a horse without a pack, but an animal with a large pack would likely be crowded over the bank, which was about 15 feet high. Two horses with large loads had been crowded over the bank the day before we passed. Our horses had very small packs now, and it was considered safe to take them across without unpacking. This opinion proved to be correct. A little farther on a glacial stream had to be forded. This stream was not deep, but the bed was lined with bowlders, over and around which the water rushed rapidly. Formerly there was a bridge here, but high water had carried it away. There is some very fair timber in this part of the valley, a scattering growth of grass, and the undergrowth that is common along the southeast coast of Alaska. A few small garden spots may be found here, but there is no extent of farming land. The soil is a disintegrated granite and in most places is stony.

We had intended to stop for the night at Workman's road house, some 18 miles from Valdez. On reaching this place, however, we learned that the *Bertha* was due to sail from Valdez the next day. The moon was at the full, and as there was a prospect that our good weather would not last much longer we concluded to travel by moonlight. After allowing the horses to rest for several hours we started, about 9 o'clock, on the last stage of our journey to Valdez. The moon shone dimly through a thin layer of cloud, giving sufficient light to enable one to follow the trail without difficulty.

The scenery in the canyon was impressive. There was no wind stirring, and the moonlight striking through the clouds gave a sort of weird appearance to objects along the trail, which winds back and forth along the wall of the canyon, now approaching the river and again going from it. The night was filled with the sound of rushing waters, and the mountain streams, which in places fall almost perpendicularly for several hundred feet, appeared like long bands of white upon the mountain side. The effect is greatest at points on the trail where one can look from some narrow ledge almost straight down on the river far below.

The trail through the canyon was the most difficult task the trail builders had to encounter, but here as elsewhere the work was well done. The Government trail from Valdez is a great help to one going into the interior. Good work has been done as far as the Tanana River, 265 miles from Valdez, and while the trail is far from being a good wagon road in the summer months, it will afford a splendid sled road, and even wagons could be used before the frost leaves the ground in the spring. To one who knows anything of trail building in Alaska the surprise is not that the trail is no better, but rather that it is as good as it is. After leaving the canyon we traveled down the bed of the Lowe River, which spreads over a large gravel flat. In places the trail led through timber for a short distance, and here the large trees, clear of branches for 50 feet, and the large rank ferns which grow in great masses, cause one to forget for a moment that these are Alaskan products.

We reached Valdez on the morning of the 28th, and I sailed on the *Bertha* about noon the 1st day of October.

ISAAC JONES,
Assistant, Alaska Investigations.

Prof. C. C. GEORGESON,
Special Agent in Charge of Alaska Investigations.

NOTES AND COMMENTS ON REPORT OF MR. JONES.

This report by Mr. Jones is the first attempt that has ever been made to describe the agricultural features of the region which it covers. He gives a succinct and systematic account of those features in the territory he passed through which would naturally be noticed by an agriculturist. The character of the surface, the kind of soil, its slopes and exposure to the sun, the vegetation, the water courses, the drainage of desirable tracts, distances, and the character of the trail. He points out the unfavorable features as well as the favorable ones. The sharp, uncompromising mountain ridges which cover large areas; the steep and rocky hillsides, and the wastes of bog and marsh land are noticed as well as the great meadows and the expansive valleys of fertile alluvium. He notes also the few natives which inhabit this region, their condition and their prospects. It is to be observed that this reconnoissance covers only the region which can be seen from the trail. Broadly speaking this is a strip about 30 miles wide by 435 miles long, the distance between the two terminals. Outside of this strip we know as yet little or nothing as regards the areas available for farming and grazing; but it may not be unfair to assume that the region south of the Yukon will average about as the strip here described. If we follow the sixty-third parallel from east to west, which nearly bisects this vast region, we shall find that the distance in a straight line from

the Canadian boundary to Bering Sea is more than 600 miles. It therefore contains twenty times the area covered by this description, and presumably the same ratio also holds good for land which may have value for farming and pasturage.

There are in this region besides the Copper and Tanana rivers the Sushitna and Kuskokwim, both of which are known to have extensive valleys. Captain Glenn, of the United States Army, explored the Sushitna in 1899, and he reported that the valley was 50 miles wide, and that some of its tributaries had also very broad valleys.

The Kuskokwim we know comparatively little about beyond the general facts that it drains a region even larger than that drained by the Copper and that its valley is in places very broad. These facts, taken together, scarcely admit of a doubt but that there are many very extensive areas of land which may have value for the farmer and grazier in the region south of the Yukon. Nor is it to be doubted that the best land from an agricultural standpoint, and the best climatic conditions which the interior affords, are to be found here.

The leading characteristics of the strip covered by Mr. Jones's report may be conveniently grouped under three heads, corresponding to the three natural divisions outlined by the drainage systems; namely, the Fortymile country, the Tanana Valley, and the Copper River region. And as each has some features which are in a measure peculiar to itself, it may be well to review them briefly.

THE FORTYMILE COUNTRY.

The Fortymile River is a considerable stream which empties into the Yukon some 50 miles below Dawson, and almost equally distant from Eagle, the first town in American territory. At its mouth is a small settlement called "Fortymile." From this point trails lead up toward its source, and to many of its tributaries, which are among the first gold-bearing creeks discovered in Alaska. Only a short distance of the lower portion is in British territory. Its entire drainage system lies in Alaska. Its general course is in a northeasterly direction, though the north and south forks, its two leading tributaries, run almost directly east, and the latter even runs southeast in a portion of its course.

The Fortymile makes but an inconspicuous stream on the map, but it nevertheless drains a large area, many small creeks radiating from it, not unlike the venation of some leaves. For a distance of about 25 miles from Eagle these small tributaries cut up the country into a series of narrow ridges, which can have but little value for agriculture. Their sides are for the most part too steep and rocky to admit of anything more than garden patches for cultivation, and they are also quite generally rocky and barren, so as to produce but little pasturage.

Having passed this region we come to the first considerable tract which may be of value for the farmer.

This is an extensive gentle slope facing toward the southwest, and which Mr. Jones estimates contains not less than 30 square miles. That amount of good land is in sight, but how much more there is must for the present remain a matter of conjecture. As far as examined the soil was found to be a sandy loam; that is, what is usually classed as a "warm" soil, and the kind one would require for the rapid growth of crops; and much of it is covered with a heavy growth of native grass, which is in itself proof that the ground is productive. Nor is timber wanted to supply the needs of the settler.

Liberty Creek, which drains this slope, runs in a southeasterly direction, and flows into O'Brien Creek, which in turn empties into the Fortymile. It carries considerable water. When Mr. Jones passed the stream was about 30 feet wide, and would average a foot in depth, and the creeks were not swollen at the time.

About 10 miles farther on the base of "The Dome" is reached, the trail passing to its left. From this landmark for a distance of 23 miles, until the trail crosses the Fortymile at the mouth of Steele Creek, is a region of rolling country, with low, round-topped hills. The whole region would afford much pasturage. Grass was found everywhere interspersed with wooded slopes, and here and there tracts from which farms could be carved. Here, then, is a tract approximating 700 square miles, or, in round numbers, 450,000 acres, which would have considerable value as a range for live stock during the summer months. How much larger the area may be can not be stated at present, as we can speak with certainty only of that portion which was in sight, and which averages about 15 miles on each side of the trail.

Steele Creek enters the Fortymile from the south at this place. The latter stream, running due east and west, is for a portion, at least, the boundary of the range country just described.

For the next 22 miles, from the mouth of Steele Creek to Franklin Gulch, the country is more rugged and broken, and has for the most part very little value for either the farmer or the grazier.

It was at the mouth of Steele Creek that Mr. Jones saw, on the 12th of September, what he describes as a small patch of very good oats. It stood 3 feet 6 inches high, and had good heads of fully matured grain. This little patch of ripe oats speaks volumes for the possibilities of the country. The seed was sown in June, he was informed, and it had therefore grown to full maturity in a hundred days or less. These oats were doubtless such as are brought into the country chiefly from California and Oregon for horse feed. The chances are, therefore, that it was not an early variety, but such as is commonly grown in California. If common oats will mature there, it is certain that

barley will also do so. And it is almost certain that spring wheat and spring rye can be grown there with equal success. In other words, these oats practically proclaim that it is possible to grow all the common hardy grains in that region, at least in the valleys and on the southerly slopes of the hills. The Fortymile at the mouth of Steele Creek is a respectable stream, even when not swollen by freshets. It is about 260 feet wide, and very swift.

From this point to Franklin Gulch, a distance of 22 miles, as already noted, and for 10 miles the other side of Franklin Gulch, the trail runs through a rugged and almost worthless region from the standpoint of the farmer. Franklin Gulch has no valley land, but about 10 miles from the creek to the southward the northern boundary of an extensive region which may prove to be some of the best country in the interior is reached. This tract comprises the "Ketchumstock Flats," which Mr. Jones describes quite fully. He estimates that there are 750,000 acres, half of which could be brought under culture with ease. In reality the area of good range country is much greater.

Beginning about 10 miles south of Franklin Gulch, or about 90 miles from Eagle, the trail runs through this rolling, grassy country for 60 miles, or to within 20 miles of the Tanana River. It is in large measure a rolling country with gradual slopes. Much of it is wet, owing to an impervious subsoil; but it is a good grazing country, and "the timber is of good size and of dense growth." In the center of this area is a grass-covered level plain about 8 miles across and increasing in width upstream. A portion of it is what the prospector calls "nigger-head land." These nigger-heads are bunches of sedges which grow in wet places, usually where seepage water from higher ground comes to the surface. The bunches or heads usually stand from a foot to a yard or more apart, and in the course of years each becomes a compact mass of roots which gradually rises from the surface to the height of a foot or more, and it may measure as much in diameter. When the dry tops are burned off it leaves the scorched and blackened heads, which may have suggested the name.

Nigger-head land is of no value for cultivation, or even for pasture, until thoroughly drained, and drainage would be too costly an operation for settlers to undertake until the country is peopled to such an extent as to cause a rise in land values. However, these nigger-head lands do not occupy any considerable portion of this vast tract. Good pasture can be found over nearly the whole area, and the Ketchumstock Flats, the boundaries of which are not fully known, can be brought under culture with as much ease as the prairie land in the west. It is in this grass country that horses have wintered successfully several times. Mr. Jones mentions two instances which are well authenticated. In one case two horses had gone through two winters and still roamed about there in a semiwild condition. Another instance was told me by a miner, Mr. Mark E. Bray, whom I met on

the Yukon. He makes his headquarters at Dawson while his mining interests are on the Tanana, and he packs his supplies out from Dawson. He informed me that in the fall of 1899 he left five mules at the head of the Chusana River, which is perhaps 75 miles to the southeast of the Ketchumstock Flats. In April the following year he found four of them sound and fat; the fifth had been killed by the Indians.

I have recorded similar instances in former reports. These facts prove that the winters are not so severe but that horses and mules can live through them in the open, and that there are large stretches on which they find enough feed to sustain life in spite of the snowfall.

The snowfall in Ketchumstock Flats and Tanana Valley is reported to be considerably lighter than on the Yukon, where it averages from 2 to 3 feet. It might be reasonably expected that the snowfall in the interior would be light, inasmuch as the region is far from the sea, and to the south and west it is bounded by high mountains along the coast, which would cause a precipitation of the moisture in the air before it is carried inland. The creeks traversed by the trail through this section are successively Ketchumstock Creek, Indian Creek, Mosquito Fork, and Wolf Creek.

Ketchumstock Creek was at the time Mr. Jones passed about 60 feet wide and 3 feet deep. It runs through the Indian village from which the region takes its name. About 10 miles farther on, Indian Creek is reached, which is only a very small stream, about 6 feet wide. It may be of importance as a source of water for stock raising. About 12 miles farther on the trail crosses Mosquito Fork, which is the name given to the upper portion of the South Fork of the Fortymile. It was so named because of the myriads of mosquitoes which infest the region. At this point the creek has an easterly course, and Mr. Jones found it to be about 150 feet wide and 4 feet deep. It has its source in the divide which separates the Fortymile country from Tanana Valley, and is fed by numerous small creeks.

Wolf Creek is a very small stream, the last crossed by the trail before the divide which separates the Fortymile system from the Tanana Valley is reached.

So far as known, cattle, which the Indians call "McKinley moose," have as yet not been introduced into this region. Some cattle have, however, been driven into the Copper River Valley. And in this connection it may be mentioned that some enterprising person drove four dairy cows into the mining section of the Chestochena the past season, and later they were driven back to Valdez. What success attended the enterprise was not learned.

THE TANANA VALLEY.

The Tanana Valley is separated from the Fortymile country by a divide, which on the north side rises in successive elevations of low, round-topped mountains covered with vegetation. It is not a stony,

rocky ridge; there is scarcely an elevation which could be called a peak in sight along the divide, and yet it is too rough to have any agricultural value, except as a range for sheep and goats. On the south side the valley is likewise bounded by a divide, which separates it from the region drained by the Copper River system. This divide is decidedly more rugged than the one on the north side, but still it has no high mountains with glaciers or snowy peaks. In the middle of September, when Mr. Jones passed through, some of the highest elevations had just been capped with fresh snow, but during the summer there are no snowy mountains within the region under consideration. The distance from the top of the ridge on one side of the valley to the top of the ridge on the other is about 50 miles. Between the two lies the Tanana Valley proper.

The river takes its rise in the same elevated portion of the coast range from which the White River and the Copper River also spring. The White River runs almost due east, and soon enters Canadian territory. The tributary of the Copper which rises here runs west until it joins the main river; and the general direction of the Tanana is northwest.

The Tanana is a large river, which measures in a straight line from source to mouth more than 400 miles, and counting the windings it may be twice this length. It is of varying width, but generally spreads out from half a mile to 2 miles in width. In the lower half of its course there are numerous islands. At the point where the trail crosses the stream is about 500 feet wide and moderately swift. The water carries much sediment and is of a milky color at this point, indicating that some of its upper tributaries take their rise in a light-colored clay soil. The valley proper, from base to base of the two divides which hedge it in, is about 25 miles wide. It is almost a level tract, with but a slight and very gradual rise from the stream toward the divide. The banks are about 15 feet high above the stream at normal level of river. So far as known the river does not overflow these banks at any time, but we have no definite knowledge on this point. Where the trail crosses the river is in about the middle of the valley.

The valley in the belt under consideration is for the most part covered with a sparse and scattering growth of spruce, with some poplars. The forest can scarcely be said to be continuous, as there are many small patches of open meadow. Near the river, and especially in low places in the bends of the stream, the growth was the densest and the timber the largest; spruce trees 18 and 20 inches in diameter were plentiful. On the dry land away from the river the timber was smaller, and the growth open and scattering. There was very little continuous grass land in sight, but scattering bunches of grass everywhere. A low straggling blueberry bush was abundant, where not crowded out by the spruce, and a very light coat of moss covered the ground. The

soil is a dark, sandy loam, and in the valley proper there was no nigger-head or marsh land too wet for cultivation. It will probably be found that the greatest drawback to cultivation is a lack of rain during the growing season, although on this point we have no definite information. As soon as settlers come in, who will undertake the work, meteorological stations should be established, not only here but in the Fortymile farming region, and in the Copper River region. How broad the valley is above and below the belt under consideration we do not know, but to judge from the mountains in sight it is as broad or broader than at this point.

Mr. Jones makes the important observation that this valley appears to be milder than the Yukon Valley. He saw no evidence of killing frost there in passing over the valley on the 17th and 18th of September, while in the Yukon Valley there had been several killing frosts before that date. This evidence is confirmed by other observers.

Mr. J. L. Green of Rampart, in a letter submitted with this report (p. 309), makes the same observation. He states in effect that the spring begins earlier, and the autumn frosts set in later in the Tanana Valley than on the Yukon. And Mr. Erastus Brainerd states in an article published in the *Seattle Post-Intelligencer* of September 29, 1901, that in the spring of 1900 the ice broke on the Tanana in the second week of April, while it did not break on the Yukon until the third week in May, and also that during the latter half of May he found ice and snow in the Yukon Valley, whereas in crossing the divide into the Tanana Valley he found the redtop grass as high as his shoulder, and lupines and vetches in bloom.

Briefly stated, all evidence so far brought forward is to the effect that the Tanana Valley has a considerably longer growing season than the Yukon Valley. And the chances for success in farming are correspondingly greater. So far as the writer has been able to learn, no attempts at gardening or grain growing have as yet been made by anybody in the Tanana Valley. There is a very promising and extensive area of agricultural land there, but the possibilities of soil and climate have not been tested.

THE COPPER RIVER REGION.

As already noted, the divide which separates the Tanana Valley from the Copper River country is quite high and in places rugged. The trail runs through a low rolling cut in the mountains, known as "Mantasta Pass." The region drained by the Copper River differs from the Fortymile and Tanana Valleys in that it is more broken and more extensive.

On the south it is bounded by the coast range, on the east and north by the watershed which separates it from the Tanana, and on the west by a divide which separates it from the Sushitna. The river rises in

the coast range and flows first northwest, then west, and finally south, in the shape of a great sickle. It has numerous tributaries from both sides, and some of these flow through more or less extensive valleys of what appears to be good agricultural land. However, that portion of the Copper River country embraced in Mr. Jones's report lies almost wholly to the west of the main stream. The region to the east of the main stream we know but little about, except the general report of prospectors that there are extensive tracts of level or rolling land.

For a distance of some 12 or 14 miles from Mantasta Pass the trail leads down the divide, then a stretch of low rolling country is reached. This stretch of between 30 and 35 miles may some day perhaps be settled by farmers; at present it appears to be too marshy. It is covered with a deep coat of moss, and small lakes, meandering streams, and nigger-head bogs are numerous. This stretch of country ends at the Chestochena River. From that stream to the Tazlena there is a gradual and marked improvement in the country. The ground is less marshy, the moss not so deep, patches of grass are more extensive, and the timber along the stream is larger. Between the Chestochena and Tazlena is a stretch of about 45 miles which in general may be described as a timbered country, with patches of grass land ranging in size from a few acres to a hundred acres in extent. The cost of clearing the timber off the ground would perhaps be the greatest bar to settlement outside the patches of grass.

Nearly midway between the Chestochena and Tazlena rivers a stream called the Gakona comes in from the west. In the upper portion of this river, prospectors informed Mr. Jones that there were large stretches which had a luxuriant growth of grass, and I have since had this statement confirmed by another prospector who had passed through a portion of it. He said he walked over a stretch of level ground with a heavy growth of grass at least 5 miles in width; how long it was he did not know. This grass land is about 100 miles west of the belt we are here discussing.

From Tazlena to Copper Center there is a stretch of 12 miles of most excellent agricultural land. The land lies in benches, one slightly above the other, which will average from half a mile to a mile in width. The soil is a dark sandy loam with a subsoil containing more of clay than on the surface.

There is no swamp land in this stretch or anything in the nature of waste land. It is partly timbered with spruce, but the growth is young and not dense. Fires have been through the whole region, which have cleared the ground of moss and killed the young trees. The land can therefore easily be cleared. The same kind of land, in all respects, continues southward for another 12 miles, the difference being that the timber is larger, denser, and is all alive. It will

therefore be too costly to clear a farm in this region for a long time to come.

The Tazlena River may really be considered as the center of the best agricultural region in the Copper River Valley and within the boundaries of the strip we are discussing, although the best portion of that region lies between the Tazlena and Copper Center, as noted.

From a point 12 miles south of Copper Center to the Tonsena River, a distance of 13 miles, is a rather wet rolling country more or less densely wooded, with small marshes in places, with a heavy coat of moss on the surface and only scattering bunches of grass. It has some value for pasturage, but can not be considered first-class in this respect.

From Tonsena River to Valdez there is practically no agricultural land and comparatively little pasture land. The trail here crosses the coast range; the best portion is the north slope of the range from Tonsena River to Kimballs Pass, a distance of about 9 miles. Here goats and sheep may find pasture. It is not likely even to become a good range country. The soil is light yellow, gravelly in nature, and abundantly covered with stones as large as one's fist.

From Kimballs Pass to Valdez the country is simply a succession of ups and downs, interspersed with rugged peaks and many glaciers, deep canyons, waterfalls, and mountain torrents. In short, it is typical of the scenery that may be found anywhere along the Alaskan coast range, and which from the sea looks so strangely grand and at the same time impresses one as a forbidding waste.

The leading streams which enter the Copper River from the west, and which were therefore crossed by the trail, are the following, in order from north to south: The Chestochena, the Gakona, the Tazlena, the Klutena, and the Tonsena.

The Chestochena is a considerable stream. At high water near the mouth it is about a mile wide, but, except when swollen, the water does not cover the bed, but runs through in a score of different channels. From this river to the Gakona is a distance of about 25 miles. The Gakona is about 250 feet wide; the bed is filled with large bowlders and the water rushes over them in torrents, which makes it a difficult river to ford, and at high water it is dangerous, if not impossible, to cross it. As a matter of fact this can be said of all the streams. From the Gakona to the Tazlena is about 20 miles. This is a small stream in comparison with the two foregoing. It is only about 60 feet wide, nor is it deep, and it can be easily forded at low water. From the Tazlena to the Klutena at Copper Center is a distance of 12 miles. The Klutena is like the Tazlena in size and in the volume of water it usually carries. It has been bridged by the Copper River Exploring Expedition under command of Capt. W. R. Abercrombie, who for three years past has been employed in exploring the Copper

River Valley and in constructing a trail. North of the Klutena none of the streams has so far been bridged. From the Klutena to the Tonsena is a distance of about 25 miles. The Tonsena is a little broader than the Klutena and carries perhaps a somewhat greater volume of water. The mountain streams in the coast range have all been bridged. The Government trail has been cleared to the Tanana River.

The Government telegraph line, which is also under construction, has been completed across the coast range to Copper Center, and is in operation.

Copper Center is a collection of about a dozen log cabins, situated in a small clearing on the north side of the Klutena River. It had its origin in the influx of prospectors which came into the Copper River Valley in search of wealth, in 1898, though at that time the settlement consisted almost entirely of tents. There was at one time several hundred people here, and during the winter of 1898 and 1899 most of those who wintered in this camp suffered greatly from scurvy and many died of this dread disease. At present most of the cabins are empty. Some few prospectors make their homes here temporarily. The Copper River Exploring Expedition has a storehouse and a few men stationed here, and there is also a road house, or so-called hotel, in the place, kept by two men.

Aside from Copper Center and the mail stations described by Mr. Jones, there are no other settlements in the Copper River Valley. During the summer season there are from 150 to 200 men in the placer camps of the Chestochena and its tributaries; and a score or more men are likewise at work during the summer on the very rich copper deposits which have been found in this region, but as yet there are no permanent settlers. That the country can produce grain is proven by the fact that Mr. Jones saw ripe oats in a garden at Copper Center.

In the judgment of the writer, the Copper River Valley has a great future. It will one day be a rich and flourishing country, and perhaps the most populous region of the future State of Alaska. Here are opportunities for thousands of families to make homes for themselves and gain independence. But before settlers can be attracted to this or any other region in Alaska the Government will have to survey the country and make the homestead law so liberal that it will be possible for poor men to take up land.

Before closing this subject a word should be said about Valdez, which is the southern terminus of the trail. If the country in the interior is opened to settlement, Valdez is almost certainly bound to become a large and important town. It lies at the head of a bay which is open the year round, and naturally it must become the port for all the traffic going in and out of the interior. Valdez is even now a vigorous and enterprising young town. There are many good houses

in the place, and the people have begun to build large and ornate churches. The town has good hotels, good restaurants, good stores for all kinds of merchandise, and is settling up with an enterprising class of people. It is not a costly place to live for the accommodation afforded. The traveler can perhaps live cheaper here than in any other place in Alaska. The writer has eaten an excellent meal at a public restaurant for 35 cents. The town is built on a gravel flat which extends back for 4 miles and there terminates in the Valdez Glacier. I present a view of the town herewith (Pl. XIX, fig. 1), taken from a boat in the harbor. In this view the glacier seems very near, but, as noted, it is 4 miles distant.

Five miles from Valdez, on the shore of the bay, in a pretty little nook under the mountain, the Government has built an army post, which has been named Fort Liscum. With its stables, warehouses, barracks, and officers' quarters, all laid out in streets, the fort appears almost like a small town in itself. The buildings are unpretentious, but have a substantial appearance, and everything has an air of superlative neatness which is characteristic of all Government posts.

NOTES ON THE COPPER RIVER COUNTRY, BY MAJ. W. R. ABERCROMBIE.

Maj. W. R. Abercrombie (then Capt., Second United States Infantry) has been in charge of the construction of the military road which is now building between Valdez and Eagle. As noted in the foregoing, this road has already been completed as far as the Tanana River, a distance of 265 miles from Valdez. The Major has spent three years in the Copper River country, and is, of course, thoroughly familiar with all its characteristics. He is of the opinion that it affords excellent opportunities for farming. In fact, he has done some quite successful experimenting. He has raised good gardens, both at Valdez and in the interior. The following letter explains the situation briefly:

TRANS-ALASKAN MILITARY ROAD,
Fort Liscum, Alaska, November 20, 1901.

SIR: I sent you by steamer *Newport*, care of Captain Moore, a sample of Finnish black oats grown in the Copper River Valley at Copper Center from the seed sent me by you last spring. The wheat matured, but was trampled down by my beef cattle. All the vegetables grew and matured. The inclosed photograph will give you an idea of the garden, which was on new ground burnt off last May.

Very respectfully,
(Signed)

W. R. ABERCROMBIE,
Major, Thirtieth Infantry.

Prof. C. C. GEORGESON,
U. S. Department of Agriculture, Sitka, Alaska.

At my request the Major has kindly sent me the following as an expression of his views on the agricultural possibilities of the region through which he has been operating:

AGRICULTURAL POSSIBILITIES OF THE COPPER RIVER VALLEY AND ITS ATTRACTIVE FEATURES FOR THE SMALL FARMER.

Having watched for the past twenty years the growth of our former Northern frontier, i. e., Dakota, Montana, Idaho, and Washington; having traversed the Yellowstone, Gallatin, Spokane, and other valleys prior to the advent of the rancher and the railroad, I feel qualified in a measure to give an intelligent opinion relative to the capabilities of the soil and the prospects of the small farmer who is constantly on the move in the search of a home in a new country.

I find the conditions as varying in different parts of the Copper River Valley as the great range of climatic conditions would naturally dictate. The disappearance of the snow and the sprouting of the grass varies at least forty-five days in different portions of the valley. Along almost every route that has been traveled by pack animals will be found scattering spears of timothy and grain.

I shall first consider the route traveled by the pioneer horsemen of the season of 1898, as that was the only year in which pack animals were used over the route from Valdez to Copper Center via the Valdez Glacier and Klutena River. During the past season spears of timothy and grain were found along this trail, which would indicate that the original seeding of 1898 reseeded itself, with the result of a volunteer crop in 1900, which to my mind is conclusive evidence that, when acclimated, grain and hay will both mature and bring forth abundant crops. From the evidence obtained in a small experimental garden it is an assured fact that potatoes, turnips, beets, peas, lettuce, radishes, and possibly many other vegetables will grow in abundance when the proper soil, exposure, and drainage are obtained. As the existence of the small farmer is conditional on the laws of supply and demand, it will be necessary, too, in this instance, having found the supply, to point out the probable demand. Two hundred and fifty miles inland from Port Valdez, in a northerly direction, lie the gold fields of the Chesna mining district, which, in my opinion, in the next few years will produce many millions of dollars of gold dust.

There is to-day, aside from the 200 or 300 head of horses, the property of the Government and individual owners, absolutely no means of transportation between these two points—Valdez and the headwaters of the Chetochena River. A pack animal loaded with forage at Valdez, if no means of subsistence were to be had en route, would consume more than the forage he could pack before reaching his destination, which fact is attested by the scores of dead horses whose carcasses mark the advancement of settlement along the Trans-Alaskan Military Road. Hay and grain to-day at Port Valdez, original cost and marine transportation added, will average \$40 per ton. This forage can not be transported into the Copper River Valley to the crossing of the Tonsena for less than 25 cents per pound, and then the margin to the freighter is extremely meager. Therefore the opportunities to-day awaiting the small farmer who will select his homestead judiciously along the Trans-Alaskan Military Road, with a view of erecting thereon a bunk house and barn for the accommodation of man and beast, and the cultivation of forage for the animal and the vegetable produce for the man, is, in my opinion, so much more enticing than the inducements held out for the bleak prairies of Dakota or the wind-swept valleys of the Yellowstone as to be beyond comparison.

Referring to my report of 1899 on this subject, I would say that I am more profoundly of the opinion to-day than ever before that the valleys of the subdrainage of the Copper River Valley will in future years supply the demand for cereals and vegetables, if not meat, of the thousands of miners that will be required to extract the vast deposits of metals from mother earth in the Chettyna, Kutsena, and other districts. Referring to the available arable land for the cultivation of forage, I shall eliminate the coast range entirely, for the reason that, owing to the heavy fall of snow the spring is generally one month later than in the Copper River Valley, the crest of

the mountains being capped, as they are, with monster glaciers, cause daily precipitation from the 1st of July until freezing weather in October. While vegetation and fodder grow luxuriantly in the coast range district, forage must be treated as silage, as, owing to the constant rain, it can not be otherwise cured.

Following the South Fork of the Tonsena will be found thousands of acres of available land for cultivation, which, having been burnt over years ago and divested of its covering of moss, needs only now to be cleared of the dead spruce timber that encumbers it, when it is ready for the plow. Five miles north of the Tonsena bridge are tracts of land well timbered and drained that are likewise available for agricultural purposes. A few miles north of the mouth of the Tazlena is a stretch of sandy, loamy soil with a southern exposure that looks attractive. At the mouth of the Tonsena River is a large hay meadow many hundreds of acres in extent on which quantities of hay could be cured. I desire to point out in this connection that a few experimental stations, with competent persons to test the soil and collect such evidence as would enable the settler to intelligently locate his homestead, could not be established at any point to better advantage by the Government than at one of the points mentioned above. * * * In my opinion the backbone of the settlement of this mighty valley is its agricultural resources.

NOTES ON THE TANANA VALLEY, BY MR. J. L. GREEN.

Having learned that Mr. J. L. Green, an attorney at Rampart, had made a somewhat extended tour through the valley of the Tanana River, I asked him to write me a statement of his views concerning the agricultural features of that region. This he kindly complied with in the following letter:

RAMPART, ALASKA, *April 22, 1901.*

DEAR SIR: Your letter of March 17 received to-day. In reply would state that I will most cheerfully furnish you all the information I can in regard to the agricultural possibilities in the Tanana country; but owing to the fact that I have not been able to experiment any in growing cereals there, my opinion would not be worth as much to you as a statement of the facts regarding that country. However, I will state both, and the opinion you can take for what it is worth.

I had heard a great deal of the country before I made my trip through it, but was pleased to find a better country than I anticipated. The country has a great many large valleys ranging from 5 to 20 miles in width and from 10 to 50 miles in length. The timber is far superior to any I have seen, either in the Yukon or in the Northwest Territory.

I also found very extensive prairies, dotted with lakes. The lakes and swamp lands would perhaps occupy one-half and sometimes probably more than half of the surface of the prairie lands; the higher ground I found dry and of a dark-brown color, and consisting of a sandy loam and very fertile.

This soil was covered with a rank growth of grass (this grass is perhaps the same as the redtop grass or herd grass we have in the States), although the same variety is found in every part of Alaska. I have not been able to find anything in any other part of the country to equal it either in quantity or quality. This grass grows to the height of from 4 to 4½ feet, and will produce from 2 to 3 tons of hay per acre. There are places where a mowing machine can be driven for 5 miles in one direction without lifting the sickle bar.

The surface of the soil thaws from 4 to 10 feet during the summer season. I was in that country during the months of August and September of last year. When I left the last of September there had not been sufficient frost to kill the leaves on the trees, although it would have killed potato vines and all the more tender vegetables.

There was a great deal of rain during September, but no snow. As I neared the Yukon I saw a great change, showing signs of heavy frosts, and when I arrived at Fort Gibbon I learned that they had had considerable frost, and quite a snow storm some two weeks before I arrived, some of which was still visible, especially on the north side of the hills and in sheltered spots. I also learned from the Indians and from white persons who have been in the country in the spring that the season is almost a month earlier than anywhere on the Yukon River.

I am informed that the Chinook winds from the coast, across a low divide in the coast range, clears that country of the snow very early. I know this, that the Tanana River breaks and clears of ice at least two weeks earlier than the Yukon; so evidently the season must be earlier.

As fine a quality of hay can be produced there as can be produced anywhere. I believe spring wheat, oats, and barley will mature there if properly handled. I know that potatoes, cabbage, peas, beans, turnips, carrots, onions, radishes, beets, and a great many other vegetables can be produced there.

Having been reared on a farm in a new country, I have taken quite an interest in and a great deal of pains to learn if agriculture could be successfully carried on in this country; and having traveled over a great deal of the territory, always taking notes of the country I passed over to satisfy myself as to the agricultural possibilities, I must confess that the Tanana country is the only part of Alaska where I believe agriculture could be successful. There can be no doubt about it. The only thing would be to convince the farmer that he must not farm as he does in the States, but must use his head as well as his hands.

To succeed there the soil must be prepared in the fall, and nothing left on the surface to prevent the rays of the sun from striking the soil as soon as the snow disappears. I find from experience that the sandy loam is a better conductor of the heat than the muck, or soil free from sand; that it will thaw from a foot to 18 inches, while the soil composed entirely of vegetable matter will not thaw more than 3 or 4 inches. I find that the nature of the soil and the natural conditions in the Tanana country all combine in a higher degree to favor agriculture than any other part of Alaska.

I sometimes think I would like to turn farmer myself for a year or two to convince the public that even in Alaska farming and grazing can be successfully conducted.

Respectfully,

J. LINDLEY GREEN.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

FARMING OPERATIONS OF MESSRS. NICOLAI AND CLARK.

Two Wisconsin farmers, Messrs. H. E. Nicolai and D. H. Clark, have formed a copartnership and begun farming operations at Dyea and Skagway. Work was begun in the summer of 1900, when some of the land was cleared, some vegetables were grown for the local markets, and some grain was raised for hay. Both at Skagway and Dyea is a limited amount of level river-bottom land of a quality well suited for farming and gardening. Of these two tracts they have secured 40 acres at Skagway and 120 acres at Dyea. The land is a sandy loam which can be easily worked, and for the present, until it becomes exhausted, it is a rich soil, producing large crops of various kinds, and they have made extensive preparations to increase this acreage next year. They have built a propagating house and hot-



FIG. 1.—ALASKA STATIONS—FARMHOUSE OF MESSRS. NICOLAI AND CLARK, DYEA.



FIG. 2.—ALASKA STATIONS—POTATO FIELD OF MESSRS. NICOLAI AND CLARK, DYEA.

beds in which to raise plants of such crops as are to be transplanted. They have barns, root cellars, dwelling houses, and they have equipped their farms with work animals and implements. Their work has so far necessarily been of an experimental character, inasmuch as they had to feel their way not only in regard to the crops which can be successfully grown there but also as regards the requirements of the market. They have thus tested all the common, hardy vegetables, potatoes, cabbages, cauliflower, root crops of various kinds, carrots, and parsnips, peas, etc., and with scarcely an exception all these crops have been grown with marked success. This year they planted 24 acres to potatoes and set out 35,000 cabbage plants. These two were their leading crops, but they also had several acres of turnips, ruta-bagas, radishes, lettuce, and such crops as are usually handled by grocers. They have, both last year and this year, raised considerable fields of barley, oats, and wheat. These grains, however, have been grown for hay and not for the sake of the grain. Hay is worth \$30 a ton, and it consequently pays better to harvest the crops before they mature than to allow the grain to ripen. Oats and barley have, however, ripened on the Dyea farm both last year and this year. I visited their farms at Skagway and Dyea early in September of the present year, and I must say that their crops were gratifying to behold. I have never seen finer cabbages, or vegetables of similar kinds anywhere which could equal theirs in quality. It is by this time an acknowledged fact that vegetables grown in Alaska are far superior in quality to similar vegetables produced in the States. For crispness and richness of flavor Alaska vegetables are unequaled. This is acknowledged by the merchants, and local produce consequently commands a higher price than the same articles shipped up from Puget Sound.

A portion of the ground which they have under cultivation is yet too new to produce the best results. Certain tracts on the Dyea farm are so low as to be flooded by occasional excessively high tides, but on the whole these two gentlemen are much pleased with the results of their efforts, and they have planned extensive improvements in the near future. They are energetic and practical men, who thoroughly understand their business, and now that it has been proved what the soil and climate will produce, there can be no doubt as to their success in the future. Mr. Nicolai has kindly consented to write an account of their operations, which it gives me pleasure to present herewith.

Pl. XX, fig. 1, shows the farmhouse of Nicolai and Clark on their Dyea farm, and Pl. XX, fig. 2, is a view in one of their potato fields at Dyea. Incidentally it shows also the kind of land they are working with. Most of it was covered with timber or stumps, which had to be cleared away. A portion of the present crop of potatoes is grown among the dead timber.

SKAGWAY, ALASKA, *October 1, 1901.*

MY DEAR SIR: According to my promise, I will give a condensed report of our work in the agricultural line here and at Dyea for this season.

Our work commenced about the middle of March in the greenhouse. The first cabbage and cauliflower seed was then sown, and the last was sown about April 1. We commenced transferring the first plants to the hotbeds about April 20.

The first cabbage plants were set in the open field May 12, and the last ones about June 15. The varieties planted were Early Jersey Wakefield, Flat Parisian, Curries Eclipse, and Early Summer. All headed well, and the first two varieties were ready for market about July 20. Some of the last two varieties named were ready for market a month later, and all made good, solid heads by September 20, some of which weighed 15 pounds.

We set out 35,000 plants, and in my experience of twenty-five years as a truck farmer in southeastern Wisconsin I never had a more perfect crop of cabbages. The quality is first class, which can be said of all vegetables raised in this section. The yield was about 15 tons per acre, and the price from 2 cents to 4 cents per pound.

The land on which the above crop was raised is of alluvial formation and was covered with a dense forest of cottonwood and spruce until two years ago. Part of it was broken up a year ago last spring and cropped last year; the balance was broken up last April, and all of it was fertilized with fresh cow manure during the fall and winter. The land which was tilled a year ago produced a heavier crop, and the heads were much more uniform in size.

Our last plants were set on ground on which we had already raised a crop of radishes, lettuce, and set onions. The radish and lettuce seed were sown April 20, and the onion sets were put out about the same time. They were marketed between the 1st and 20th of June. This particular part of the cabbage field spoken of is shown in the foreground on the photograph containing the two ladies and a gentleman in the center of the field (Pl. XXI).

I need not dwell long on our experience in raising rhubarb; the photograph will speak for itself. We sowed the seed a year ago last April, and transplanted the roots last May; the result is shown in Pl. XXII.

Ruta-bagas, turnips, radishes, and lettuce need scarcely be mentioned here, as they grow as luxuriantly here as weeds do in Wisconsin; all that is necessary is to scatter the seed. We sowed turnip seed as late as June 20 and got a good crop, but ruta-baga seed should be sown in the spring to insure a large crop. We had some weighing over 15 pounds.

We have not been able to raise large onions from seed as yet, but have had very good success in raising them for bunching. For this purpose we had them as large as 1½ inches in diameter.

Radishes, lettuce, and green onions can be had fresh from the garden here from June 10 to October 1 by sowing the seed at intervals during the summer.

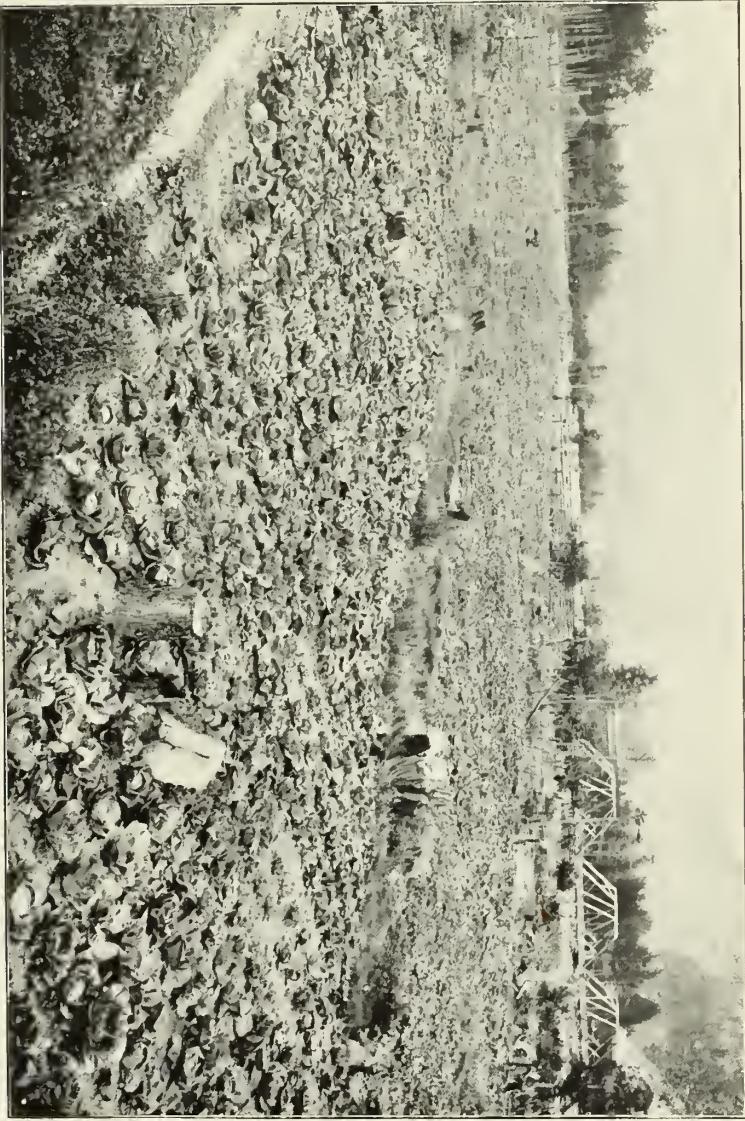
Our table beets made a fine growth this year. They were ready for bunching for greens June 20, and by the last of July they had attained a size of 3 or 4 inches in diameter—just a good market size.

Other vegetables that we have experimented successfully with are carrots, parsnips, salsify, parsley, celery, kale, kohl-rabi, spinach, and cauliflower. The last mentioned is the finest in flavor of any I have grown.

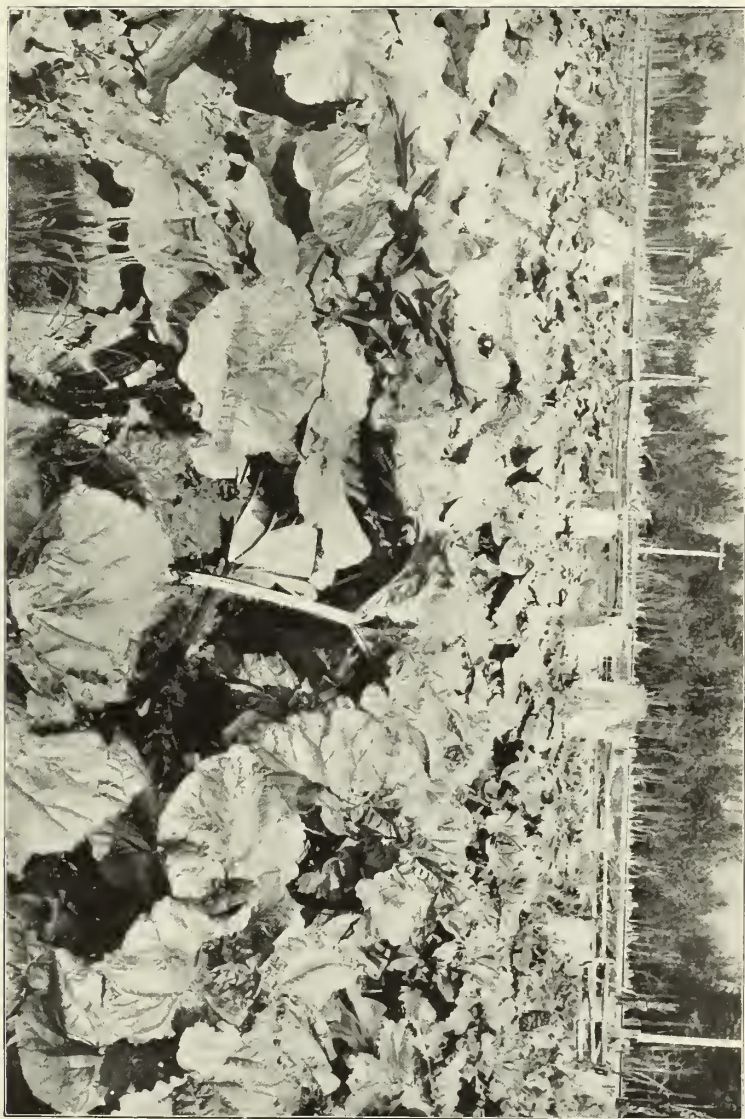
The above finishes the report so far as our work in the vegetable line is concerned, but I feel it would be an injustice to Skagway if I did not mention the wonderful growth and beauty of our flowers.

The photograph showing the greenhouse, with Mr. and Mrs. Clark seated on the edge of the hotbed, has a cluster of dahlias and nasturtiums in the foreground, which commenced to bloom about July 10 and are still blooming. The dahlias are exceptionally fine, being very large and perfect in form. The poppies commenced

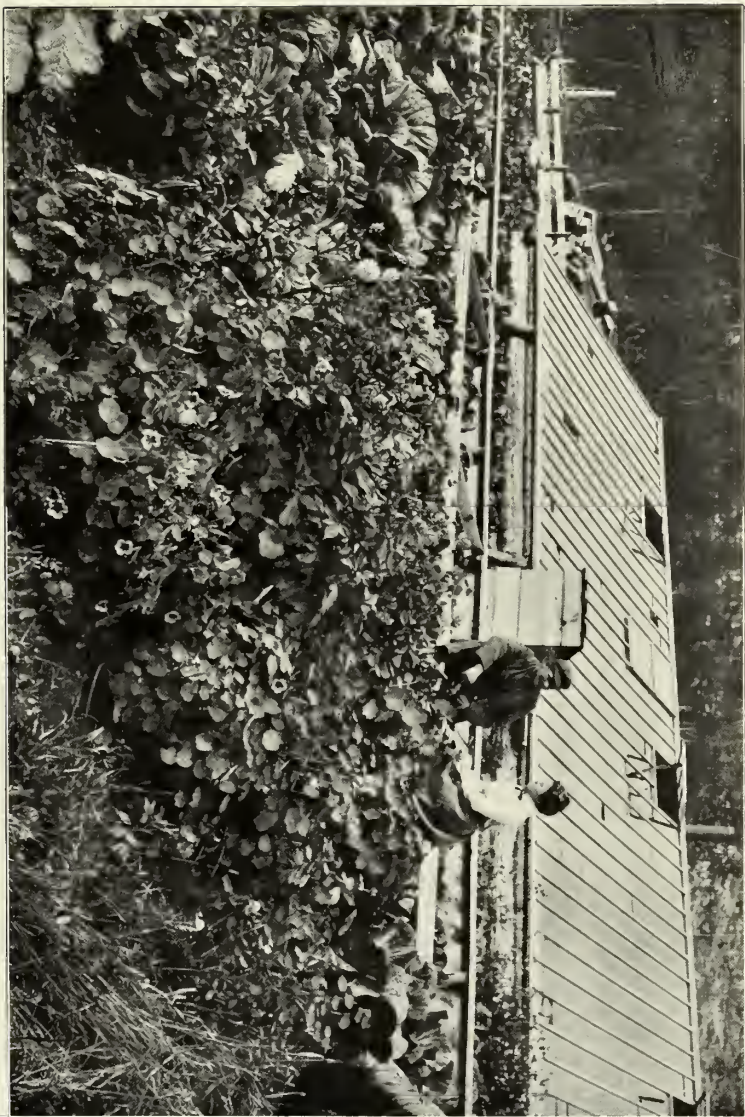
ALASKA STATIONS—VIEW OF A PORTION OF THE CABBAGE FIELD BELONGING TO MESSRS. NICOLAI AND CLARK, SKAGWAY.



ALASKA STATIONS—A FIELD OF RHUBARB BELONGING TO MESSRS. NICOLAI AND CLARK, SKAGWAY.



ALASKA STATIONS—PROPAGATING HOUSE AND LUXURIANT GROWTH OF FLOWERS, GARDEN OF MESSRS. NICOLAI AND CLARK, SKAGWAY.



to bloom about the same time and have continued in full bloom ever since (Pl. XXIII).

The sweet peas, which are shown in the photograph at the base of the greenhouse and at the right of Mrs. Clark, have been in bloom the greater part of the season and will continue until frost comes.

Mrs. Bigger, at Dyea, had pansies in bloom the first week in May, which had been in the open ground all winter, and are in full bloom yet. Pansies do exceptionally well here, but nearly all ordinary flowers do well, roses included.

EXPERIMENTS AT DYEA.

The land at Dyea is similar to that of Skagway, only a little more sandy and somewhat drier, so that we shall be compelled to irrigate some for certain crops.

I commenced operations at Dyea May 6, with three men and three horses. In explanation I will mention that there had been no preparation made for farming previous to this time, except that there had been a few acres of tide land broken up the year before and sown to grain, which was cut for hay, and about 5 acres in an old slashing where the rotten logs had been picked to pieces and piled. I will also mention that I met with new conditions here in the line of farming, which require new methods of treatment.

On May 10 we planted our first potatoes, $1\frac{1}{2}$ acres of Early Ohio, and on May 15 we planted $4\frac{1}{2}$ acres more of the same variety. May 18 we planted 2 acres of the Early York variety, and another acre of the same variety May 21. These were all planted on what might be classed as semitide lands. Most of this land was covered by débris that was deposited there during extraordinarily high tides. The results from this land were not satisfactory so far as our potato crop was concerned. The land is so salty that 4 acres of the potatoes did not come up at all, and while the balance came up quite strong, they made a weak growth after they got about 3 inches high. I think the dry weather was mainly the cause of the weak growth, there being no rain to speak of during the months of May, June, and July, but I am also satisfied that there is too much salt in this soil for potatoes to do well.

We commenced using potatoes from the field July 28, and by August 15 they were dry and mealy, but rather small, although there were quite a good many potatoes that weighed half a pound each. Some of the vines began to turn yellow by August 1, but at that time our rains commenced and they started a new growth which was more of a damage than a benefit at that stage of the crop.

We commenced harvesting the crop September 18. There were about $5\frac{1}{2}$ acres left after deducting the ground that was too salty to grow anything. They yielded 480 bushels and were of fair quality, though rather small and containing a few rotten ones.

On the same kind of land as already described, on May 16, we sowed 2 acres of oats mixed with field peas and 2 acres of wheat. The wheat proved to be fall wheat, so it did not head. It made a slow growth all summer and is now a perfect mat, covering the ground completely, but there is some danger of its being winterkilled on account of its exposed location. The oats made a fine growth, attaining a height of 4 feet. The berry was large and heavy, and it commenced to ripen during the last of August, but was cut for hay.

Our next experiment was on $3\frac{1}{2}$ acres that had a very heavy growth of flower-de-luce on it; also some small spruce trees, which we grubbed out. After thoroughly fitting the piece we planted it on May 24 to three varieties of potatoes, viz, Early Ohio, Early York, and Milwaukee. The Milwaukee had been chilled before they left Wisconsin, so that there were only about half that grew. All made a weak growth at first on this piece, owing to the tough sod, but improved as the season advanced. There was plenty of subirrigation in this piece, and it was the only piece

that did not suffer from the drought this season. These are being harvested at this writing, and are of fair size and good quality, being well ripened and yielding about 100 bushels per acre.

The next piece consisted of $3\frac{1}{2}$ acres of similar land; that is, the surface conditions were the same as on the previous piece, but the soil was much heavier and had a tendency to "bake" after it was plowed. Two acres of this piece were planted to Early Ohio potatoes on May 30, and the balance sowed to barley the same day. Both barley and potatoes came up weak and spindling. The potatoes were harvested September 28. They were rather small, but thoroughly ripe and of good quality, and yielded 100 bushels from the 2 acres.

The barley was eaten off about the middle of July by horses that broke into the lot, which proved to be a benefit to the crop. When the rains commenced in the fore part of August the barley started a new growth, so that by September 24 we cut it for hay. It was about $2\frac{1}{2}$ feet high, well headed out, and the berry was fairly well filled. The straw was juicy and hard to cure.

Our next attempt was to clear up an old slashing where the greater part of the timber was cut off in 1897 and 1898. The fire had swept through it and killed the remaining trees, some of which had already tumbled over. We commenced work on this piece May 31. It was a great undertaking to put in a crop that late in the season under these circumstances; but by June 15, we had 8 acres planted and June 20 we did our last seeding. It consisted of 2 acres of turnips, one-half acre ruta-bagas, and $1\frac{1}{2}$ acres of barley. The varieties of potatoes planted in this place were Early Ohio, Early York, and Milwaukee. The Milwaukee did not get quite ripe on this piece, but were of good market size and of good quality. The Early Ohio and Early York were about ripe, as the vines were quite yellow October 1. The last planting, June 15, made the most vigorous growth of vines and had also the finest tubers. We have only dug a few in this piece, but the estimated yield is 1,000 bushels. The quality is first class and the potatoes are of good market size. Some very large. If the space that is occupied by the stumps was deducted from the 8 acres, they would easily go 150 bushels to the acre. The turnips made a fine growth. We commenced pulling them for market September 6 and have plenty of them on hand yet. The ruta-bagas are small, although there are some of marketable size. They should be sown earlier in order to insure a full crop. The barley did exceptionally well, being 4 feet high, well headed, and in blossom when we cut it for hay, September 24.

On August 20 we seeded 2 acres of this same kind of land to fall wheat and 2 acres to rye, and seeded all 4 acres to timothy and alsike clover, all of which has made a vigorous growth. I have just completed an irrigating ditch to cover this tract of 16 acres, so that we shall be in better shape next year to raise a crop, if the season happens to be dry again. We seeded about 20 acres of this old slashing to timothy and clover a year ago last May, or, in other words, we scattered the seed among the logs and brush; the result is a fine stand of tame grass.

FRUIT.

I brought 30 fruit trees with me from Wisconsin last April, consisting of the following kinds: Twelve apple trees, 12 plum trees, and 6 Early Richmond cherry trees. The apple trees consisted of 6 Duchess of Oldenburg and 6 Transparent, and the plums of the Wild Goose and Wolf. They were shipped to me in Wisconsin in December, and from there forwarded to Skagway in April, and were in very poor condition on their arrival here. The result is that only 17 out of 30 lived. The Duchess are all alive, having made a healthy growth, and ripened their wood in August. Of the Transparents 4 lived, made a fair growth, and ripened their wood. The Wild Goose are all alive and made an enormous growth, but the wood is not ripened off at this writing. Most of the Wolf were virtually dead before they left the nursery, but one of them lived and made a good growth. The cherry trees from the nursery all died,

but I had also brought 6 little cherry trees from my home in Wisconsin, which made a healthy growth and ripened off the wood in August.

I set out about 200 strawberry plants on May 20. It was between life and death with them until August 1, when we had a good rain. Since then they have made a vigorous growth, until now they are the finest plants I ever raised, though I have been a grower of them the past twenty-five years. In conclusion, allow me to say that I am well pleased with our summer's experiment, and shall try to double our efforts during the coming year.

It would be hardly fair to close this report without mentioning my neighbors' success. Mr. William Workman has 6 acres of potatoes and about 12 acres of grain. The oats and barley were ripe by the middle of September, and though the wheat was green it made excellent hay. The whole was on land plowed last fall, and made a heavy growth. His potatoes were mostly Burbanks, and yielded about 200 bushels per acre, being on old ground, some of which had been manured. Mr. L. Wilson had about one-fourth of an acre of Burbank potatoes which yielded at the rate of 300 bushels per acre. They were large and of good quality. The ground had been well manured before planting.

There is but one drawback to the development of agriculture in this section of Alaska, and that is the want of title to our land and the meager amount of land allowed to a squatter. I can see no valid reason why the general land laws of the United States could not be extended to Alaska, or such portions of them as would give us a chance to acquire title to our holding, and not be continually at the mercy of the claim jumper.

H. E. NICOLAI,
Dyea, Alaska.

Prof. C. C. GEORGESON,
Special Agent in Charge of Alaska Investigations, Sitka, Alaska.

PRIVATE GARDENS AT SKAGWAY.

Being compelled to wait in Skagway for a boat for two days in the early part of September, I improved the opportunity to look over the private gardens in the town. I found them to be not only numerous, but excellent. There were in Skagway the past season not less than 50 private gardens, none of them very large, but most of them large enough to supply vegetables to the respective families. Potatoes were the leading crop, followed closely by cabbage, cauliflower, turnips, lettuce, radishes, carrots, and parsnips. In some cases cucumbers were also grown successfully. Flowers were also well represented. There was scarcely a dooryard in which could not be found a fine collection of the hardy annual flowers. Pansies and sweet peas seemed to be the favorites, but poppies, nasturtiums, mignonette, marigolds, larkspur and a dozen other annuals were also much in evidence. The remarkable feature was not that the residents should attempt to grow these things, but rather the extraordinary luxuriance of everything. I have seen no finer pansies and sweet peas anywhere than could be found in some of these Skagway dooryards. Fine patches of lawn could also be seen here and there. A splendid sod of close-shaven grass presented a carpet of green which could not be surpassed. Patches of red clover could be seen here and there 2 feet

high and timothy 3 feet high. All of which proves that gardening is possible in Skagway.

The following clipping was taken from the Daily Alaskan, published at Skagway, July 24, 1901. It indicates that the community is supplied with native-grown products:

LETTUCE.

For the first time in the history of Skagway native-grown lettuce and radishes are a drug on the market. There are so many good gardens this year that the novelty of home produce has ceased.

Nearly every householder has at least a small bed of lettuce and radishes, and they grow so luxuriantly and with such little care that those who have planted these succulent vegetables have a surplus to donate to their neighbors. Green peas, fresh from the gardens of Skagway, are now plentiful in the market, and young onions have been pulled daily for the past month. Anyone who is skeptical about the adaptability of Alaska for gardening need only to take a walk about the city and see the rank growth of vegetables in the kitchen gardens to gain full faith not only in the fertility of the soil, but in the adaptability of the climate for growth and maturing of the hardier varieties of vegetables.

GARDENING ON THE PORCUPINE.

The Porcupine has, since the discovery of gold, had a considerable influx of miners and prospectors. It may be explained that the Porcupine here referred to is not the Porcupine of the North which empties into the Yukon and Fort Yukon, but the region north of Haines Mission, including the territory claimed by the Canadians, and which takes its name from Porcupine Creek. The accompanying illustration (Pl. XXIV) shows in a graphic way what is being done in the line of gardening in that region. The photographs from which both plates have been reproduced have been furnished by Mr. F. F. Clarke, and they represent a view of his garden and some of his vegetables. The cabbages were planted out in the latter part of May and the photographs were taken near the middle of September, consequently the growing season would be extended by nearly another month before killing frosts would occur. The products are highly creditable not only to the grower, but to the region. Mr. Clarke furnishes the following information in regard to his garden. He states that he will have about 6 tons of strap leaf turnips, about 25 tons of ruta-bagas, and 1,200 head of cabbage, and that he raised oat hay 6 feet tall. All of these facts are of interest and speak well for the possibilities of Alaska.

LETTERS FROM SETTLERS.

I submit herewith a number of letters received from settlers in nearly all parts of the Territory. They relate for the most part to the experience of the writers with the seeds which have been sent them from the agricultural experiment station. It will be noticed that all



ALASKA STATIONS—FIELD OF CABBAGE, PORCUPINE, 1901, GROWN BY F. F. CLARKE.

are of the same tenor. Wherever the soil was in proper condition and the crops received the necessary amount of attention the results have been very satisfactory. There is no longer any doubt in regard to the possibilities of gardening in Alaska, in the interior as well as on the coast, though it is true that the experiments in the interior are as yet somewhat limited, but as a rule success has attended proper efforts.

A feature of some of these letters which merits more than passing attention is the fact that the Indians have in many instances been induced to raise gardens by the example and assistance of the white settlers in their neighborhoods. This is an encouraging feature. It fosters the hope that if the Indians could be taught how to raise the most common hardy vegetables they would in many cases do so with great benefit to themselves. The theory that the Indians will not eat vegetable food; that they mostly, and always will, live on meat and seal oil or starve has no foundation in fact. The natives will make use of any food material, though perhaps they have a preference for that which comes handy and can be obtained with the least exertion.

MUCH PLEASED WITH HER GARDEN.

SITKA, ALASKA, *October 28, 1901.*

DEAR SIR: We wish to thank you for the garden seeds furnished, and would like to report our great success.

Our garden is situated where it gets the sunshine all day. It has been well worked for four or five years. No fertilizer was used this year at all. It consists of a plot of ground 30 by 80 feet.

We commenced making our beds the 27th of April and planted lettuce and radishes. The spring was cool and the seeds were a little slow in germinating, but grew rapidly as soon as the warm days came. We continued to plant these during the summer, and still have both lettuce and radishes in abundance. Our peas were sweet and the pods well filled; turnips large and sweet, and cauliflower did remarkably well, many of the heads measuring 12 inches in diameter. The beets were exceedingly fine and grew to be quite large. We planted onion seeds, but it was a little late; but we have had an abundance of green onions all summer. Carrots, kale, and rutabagas did well, and are as fully grown as I have seen farther south. The cabbage have large, firm heads, free from worms, the pests of our neighbors farther south. At this date we have just commenced to use our parsnips; many of them over 14 inches in length, and as tender as any we have ever cooked.

We also raised two varieties of beans, which did well, ripening the 1st of September. From nine hills of potatoes we had enough to supply a family of three a month.

We have had several rows of celery, which has headed out well, and it is firm and crisp.

Strawberries did very well, and from two small rows we had enough for our family for about two weeks. We had a few raspberry bushes, from which we gathered each day enough for dessert for six weeks and also put up several jars of jam. From two or three gooseberry bushes we secured plenty of gooseberries for sauce for two weeks. We have also a few bushes of the red and white currants, which yielded an abundance of currants for table use for six weeks and over 20 pints of the most delicious jelly we ever tasted. It is a good rich color, well flavored, and solid.

We have raised from the seed six dozen asparagus plants and set them out. They

are about 6 inches high and very thrifty. This is merely an experiment, as Sitka has not an asparagus bed, but we have no doubt of its ultimate success.

Our rhubarb has been exceedingly productive and does well here. We also have parsley and an abundance of horse-radish.

There is no reason why the people of Alaska should not raise all of these vegetables, as they can be as successful here as in Oregon or Washington, and lettuce and radishes much better. Owing to the cool summers and frequent rains, vegetables do not dry out, or become pithy, and can be kept in excellent order from June till November.

Thanking you again for the seeds, I am, sincerely, yours,

Mrs. GEORGE STOWELL.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GOOD GARDENS AT WRANGELL.

WRANGELL, ALASKA, *November 1, 1901.*

DEAR SIR: Last spring you were so kind as to send me some seeds, and I now wish to tell you what I think of agriculture in southeastern Alaska.

The season has been an exceptionally wet and cool one here, so I am told, and yet I have fairly good results from my garden, although I think it could have been more satisfactory had the ground been properly fertilized, as it has been in use for years, and while crop after crop has been taken from it nothing has been given back in return.

On the 18th day of June I planted peas, radishes, turnips, lettuce, carrots, and a few beans. All except the latter came on and did splendidly. From three short rows of peas we enjoyed several good messes in a large family. The radishes came on very rapidly, and had an excellent flavor and were brittle and palatable for weeks after the first came into use.

The turnips surprised everybody, they grew so rapidly and were of such fine flavor.

Within four weeks after planting we had heads of lettuce that would have done honor to any country. The turnips grew rapidly and were sweet and juicy, though when about as large around as an ordinary tea saucer they cracked open, but this did not injure them for table use.

Potatoes that I planted did only moderately well, though those put on the market here from a neighboring garden were large, well matured, and of fine flavor, some weighing 3 and 3½ pounds.

The most peculiar thing is regarding cabbage. The plants grew to a height of 18 inches and 2 feet without a sign of heading, and just when we thought of cutting them for greens begun to head, and inside of three weeks we had cabbage weighing 6 and 8 pounds and of a quality second to none.

So after watching the growth of vegetables, I am well satisfied that everything except beans, tomatoes, and cucumbers can be as successfully grown here as anywhere if proper attention is given to fertilizing and draining the ground. The soil being of a moist and chilly nature, this is very essential, as it would be on soil of a like nature in any section of the country.

I thank you most heartily for a copy of your fourth report, which I have lately received and perused with much interest. It seems to me that this report should be widely circulated, to correct the prevailing idea throughout the outside world that Alaska is a country of perpetual ice and snow; that no good can possibly come of it.

Yours, very respectfully,

A. V. R. SNYDER,
Deputy Collector Customs.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GOOD RESULTS AT KASSAN.

KASSAN, PRINCE OF WALES ISLAND, ALASKA,

November 1, 1901.

DEAR SIR: The seeds you so kindly sent me were duly received this spring. I planted some myself, and I gave the balance to the Indians here, as requested by you. The Indians here are the Hydahs, and all of them raise good gardens every year. As for myself, I have lived here for the past seventeen years, and I have tried a garden every year. The seeds you sent me were all good and every one came up. The carrots were fine and did well—I got 9 sacks of them; while peas, parsnips, and radishes also did well. Onions and my potatoes did not do so well. The ground I planted them on was new, and I did not expect so much this year, but will have enough for my family this winter. Next spring I shall plant a big garden.

The kale you sent me I planted in my new ground, and you never saw stuff grow as it did; we had several messes of it and gave away lots, and still there is kale left now 15 inches high.

I want to set out some blackberries, currants, and gooseberries. Can you inform me where I shall be able to get the roots? I also want some pie plant.

I inclose the names of the Indians I gave the seeds to. I have shown them how to plant them and take care of them.

I was born on a farm in Illinois and know a little about it, and as long as I live I shall try and raise a garden of some kind.

Yours, truly,

W. T. BERNARD.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GOOD RETURNS FOR LABOR.

LORING, ALASKA, *September 2, 1901.*

DEAR SIR: I desire to say with reference to seeds sent from your station, that it was quite late before I received and planted them. We had a very wet August, but my garden was very good, especially onions, radishes, lettuce, peas, and ruta-bagas. I spaded it up, and cultivated with a hoe, and fertilized with manure from cow stable. We still have plenty of rhubarb, etc.

I have no doubt alfalfa and other grass seed would do well here, and hope to try them next year. I would like to have some of your Pomanow spring wheat. I am the only person at this place that has planted a garden.

I can not give amount of onions, radishes, etc., raised an acre, as I was too busy otherwise to take any measurements. The soil gave good returns for all my labor, and I shall expect to do better another year.

Respectfully, yours,

F. KNIGHT.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

REPORT FROM SUNDUM.

SUNDUM, ALASKA, *April 20, 1901.*

DEAR SIR: As the season is about closed I send you my report. All of the new ground we put in this year has been a failure. The old ground has done fairly well. We raised some ruta-bagas which went as high as 7 pounds, and some white turnips are 11 inches in diameter. Cauliflower and cabbage have done well, but the onions have gone too much to tops.

I have tried some tame strawberries; they had some fruit this year of fair size. Is

there any way to kill worms? I tried some tobacco, but it did not get big. I will try again.

Where can I get a copy of land laws?

C. F. STITES.

Prof. C. C. GEORGESON,
Special Agent, Sitka, Alaska.

REPORT FROM DYEA.

DYEA, ALASKA, *November 14, 1901.*

DEAR SIR: Your letter of the 2d instant received a few days ago, and I take great pleasure in answering it. I only wish I had more to tell you, but to tell the truth, my lack of implements necessitated some rather crude methods.

My idea at first in putting in my crop was simply to raise feed for chickens, as I meant this for a chicken ranch. I used no fertilizer, simply burning off the brush, and was astonished at my own success.

The wheat and oats were fully ripened before I cut them. I think I was most pleased with the wheat; the heads were full, and it was so heavy that I was unable to use a cradle. I intend next year to put in a larger crop, and feel confident that it will more than repay me.

Alaska has a grand future before her, I feel confident, and I am planning to make my home here for years to come. I have had my ranch platted, and intend to plant a crop on it in the spring.

Sincerely, yours,

L. ROSS STACY.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

A FINLANDER'S EXPERIENCE.

SEWARD CITY, ALASKA, *October 8, 1901.*

DEAR SIR: This spring was later than the year before. I planted potatoes from the 19th to the 25th of May. They did fairly well and are fine potatoes. Two years ago I planted potatoes on the 14th of May and had new potatoes July 8.

The ground I have been gardening on covers very nearly one acre and a half. One patch of ground is in potatoes for the third season, and did better this summer than before, and has never been manured at all. The soil is very rich, about 2 feet deep, and I think it will produce crops for many years to come without being manured. I am going to break some more ground this fall. I think it is wise to let the ground lie broken over winter. It has been tried in Finland, the country where I came from, and it seems to do the soil good. The climate over there is very nearly the same as here. I think one could raise almost any kind of vegetable here, if one had a hothouse to start the seeds in and then transplant them when the soil gets warm enough.

Potatoes grow to a pretty good size here. Some weighed a pound and a quarter. They are the finest eating potatoes I have ever had anywhere. They are far better than the potatoes brought up from the States. This can be seen from the difference in prices. Last year in Juneau the potatoes which were raised in Alaska sold for 4 cents a pound, and potatoes brought up from the States sold for 2 cents a pound.

People used to doubt if potatoes raised in Alaska would stand the winter well, but

I can say from experience that they can stand the winter far better than the potatoes that come from the States. They are in a better condition in the spring. During the winter they are just like new potatoes from the ground all winter.

I will be very much obliged to you if you will send me some more seeds. I would like to try them next spring.

Yours, truly,

FRED HANNILA.

Prof. C. C. GEORGESON,

U. S. Department of Agriculture.

SUCCEEDS IN SPITE OF ADVERSE CIRCUMSTANCES.

HOONAH, ALASKA, *October 8, 1901.*

DEAR SIR: In making report of my garden this year there are two factors tending to make my report worthless. The first is the deep snow of the preceding winter, and the second is the fact of my absence from Hoonah from July 9 to September 4. Gardens don't grow without care, and much of mine was hoed only once, and was never thinned.

Owing to the great snow—it was 20 feet deep against our house—our garden was late in being planted. My first was planted May 7, on the south of a building and with snow only a few feet distant. This produced fine lettuce, peas, wax beans, beets, and radishes. Rhubarb seeds also produced good plants. This ground had been fertilized with chicken manure and partly with ashes. It had never been planted before. Some of the beets were transplanted and did equally well.

On May 20 I dug my first parsnips of the preceding year, which had been sealed up by snow and frost during the winter. They were a good size and excellent in quality.

During the same week I planted more garden, also some flowers. This gave some nice cabbage and beets. Horehound and sage did fairly well. Celery and asparagus failed to appear, even after planting a second time. Parsley did well.

Of the flowers planted nasturtiums seem to own the country; they grow so luxuriantly. Poppies and marigolds—the latter from seeds 5 years old—gave excellent results. Mignonette and sunflowers did well. The latter have seed disks fully 6 inches in diameter, but I don't think the seeds will mature. Pansies from the seeds produced some of the finest flowers possible.

I sowed the clover seed partly on ground dug for the purpose and partly among other grass. The first has done nicely. Only a little of the other came up, as the season was dry.

My last planting was June 12—carrots, parsnips, beets, potatoes. Were not thinned, and hoed only once, so of course they are small. But I have learned that potatoes will do as well if only the skins are planted as the large pieces.

Some of the seeds were secured from Peter Henderson, but I am unable to say which varieties gave the best results. When we came here we brought a variety of peas with us in a package labeled "Klondike Seeds," which we consider a much better producer than the variety you sent. We have forgotten the name but wish we could secure it again. It grew taller and was much lighter in color than this.

Many of the natives planted seeds that you sent, but I don't know the results.

Hoping to be able next year to write more accurately, and thanking you for past favors, I am,

Sincerely, yours,

(Rev.) WM. M. CARLE.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

REPORT FROM HOONAH.

HOONAH, ALASKA, *October 18, 1901.*

DEAR SIR: I have lived at Hoonah since the year of 1884, and have raised vegetables very successfully, making garden nearly every summer. Radishes, lettuce, beets, turnips, carrots, peas, potatoes, cabbage, and cauliflower do well.

The ordinary garden flowers do well also. I planted all the seeds you kindly sent me this summer, and nearly all came up and bloomed well, although it was a very dry summer. I planted the following seeds the last of May: Sweet alyssum, mignonette, marigold, zinnia, poppies, chrysanthemum, nasturtiums, collinsia, candytuft, sunflowers. Pansies come up from year to year. My flowers are still in bloom at this date. I wish I could bring them all in the house instead of letting the frost take them.

The U. S. S. *Gedney* was in our bay nearly all summer. I kept their table pretty well supplied with vegetables and flowers.

My flower garden was admired by every one; even the Indians would stop to gaze upon it as they passed along.

I hope you will cheer me again with some seeds next summer.

With thanks for past favors,

Yours, very respectfully,

Mrs. J. W. McFarland.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

EXPERIMENTS AT KODIAK BAPTIST ORPHANAGE.WOOD ISLAND, KODIAK, ALASKA, *September 25, 1901.*

As requested in your favor accompanying the seeds sent last spring, I herewith submit report of what has been accomplished with the same.

Asparagus was sown in open ground, very rich, April 27 and in cold frame April 29. Again in open ground in May. All sowings did well, but the plants in cold frame are much the best. They are a foot or more high at this writing.

Wax beans, no good.

Beets, few seeds germinated, and most plants throw up seed stock as soon as a few leaves are set.

Carrots, sown April 29 and May 7. Seed very slow in germinating; on old, rich land plants that finally appeared made large roots. Seed on rich, new soil sprouted better, but roots are small.

Cabbage, sown in cold frame April 29. Few plants are headed. Cabbage sown in boxes in the house and transplanted into cans, and then into garden, have made the best heads I have ever raised here. Some heads will weigh 6 pounds.

Cauliflower, same result as cabbage. Many plants now have a large amount of foliage, but no heads. A few have made excellent heads.

Celery from seed was worthless. Some plants secured from the A. C. Co. are making excellent showing.

Cucumbers were sown in a cold frame, and plants grew well but amounted to nothing.

Kale flourishes exceedingly well, and produces a large number of tender leaves.

Lettuce is one of the best and easiest to raise of all the vegetables. Sown in open ground April 27 and in cold frame April 29, it has kept us supplied with large, tender heads all summer. Some heads are more than a foot in diameter, and the centers have been almost as solid as cabbage for a diameter of 3 inches. The leaves do not get tough and bitter as they do in the States.

Mustard was sown May 7, and grew well, and matured seed.

Onions from seed have always been a failure here.

Parsnips, same result as with carrots.

Parsley was sown in a cold frame from April 29. It has made little progress. The seed germinated, but the leaves are small and the amount small.

Peas were planted April 27 in open ground, and have done well all summer. Seed has matured in addition to furnishing green peas for table use. Blossoms are on the vines now.

Radishes have never given trouble. They grow well and to large size. They retain their tenderness and freshness well.

Rhubarb was not planted, as we have a large number of roots, most of which have been raised from seed the past few years. Some of the stalks will measure 4 inches in circumference.

Spinach has always been a failure here. Seed stalks are sent up almost as soon as the plants are through the ground. I had two or three plants that were in good form for greens this summer.

Turnips always do well. We gathered some that weighed $2\frac{1}{2}$ pounds, and were smooth and tender.

Ruta-bagas have not done so well as turnips. The tops are very large, and they would make good forage, but roots are small.

The clovers were sown early in May, and some of the seed germinated. There are some plants now to be seen, but the stand is not good, nor do the plants look flourishing. White clover sown several years ago in our front yard is doing nicely and spreading rapidly, notwithstanding the constant tramping of the children.

Romanow spring wheat, Manshury barley, and Finnish Black oats were sown in the garden May 7, and all made a heavy growth. Some stalks of oats and barley stood 6 feet high, and the wheat was little less in height. The barley has been cut, and the yield was excellent. On 210 square feet there were $9\frac{1}{4}$ pounds of grain, which is at the rate of 40 bushels per acre.

The oats and wheat are not matured at this date, but may mature sufficiently to make seed before heavy frosts come.

Other patches of each were sown, May 29, 30, and June 1. The growth has in all cases been good, even on new soil, but none will mature except possibly a small patch of barley, which is now turning yellow. The grain could have been sown early in April had it been here, and in that case all would have stood a favorable chance of maturing.

I received a good-sized shipment of garden and farm seeds from a well-known seed company in the States, and it may interest you to know the result of planting that. As the seed did not reach here until June 10, the chances were against success, but some kinds did well.

A barrel of potatoes, consisting of Salzer Sunlight, Earliest, All the Year Round, Daughter of Early Rose, Sir Raleigh, arrived in bad condition, from being so long on the road, owing to a mistake on my part, but have proved that they are all good seed for Alaska. The yield is good and the tubers large and smooth.

Some sand vetch was tried on a sand field near the beach and is worthless.

Earliest Russian millet amounts to nothing, although tried in various localities.

Giant spurry made a good growth on good soil, but on sand did nothing.

Timothy could not be expected to do better on old or new ground.

Dwarf Victoria rape on good soil has made a good yield of forage.

Cow and hog peas in favorable places have done fairly well.

Spelt was planted on sand and on new soil. On the first it grew 14-24 inches high and was well headed, but the stand was light. On new soil the stand was better, the straw good, and the heads larger. Neither had time to mature.

I secured also some shrubs and trees as follows:

A crab apple which has made a fair growth this summer; an apple, which is

vigorous and healthy now; a plum which sent up a shoot from the root, the top being dead, but the shoot was accidentally broken off; a lilac, which is now a healthy plant; two peonies, which are doing well, and a Chinese wisteria which has made the best growth of all.

The flower seeds you sent were highly appreciated, and we have had several beds of blossoms for weeks from them.

Wishing you continuation of success in your work, I am, yours sincerely,

CURTIS P. COE.

Prof. C. C. GEORGESON,

Special Agent in Charge of Alaska Investigations.

REPORT FROM KADIAK.

KADIAK, ALASKA, *September 26, 1901.*

DEAR SIR: I wish to inform you that the seeds I received from you here turned out very well, except the cucumbers, which failed, and the onions did not get very large. The asparagus took a long time to germinate. I followed your directions in planting the seeds. The ground is a black soil, and this year I used barnyard manure, which I find very effective.

Last spring was cold and late; I did not plant my garden until the 7th of June. We have, however, had splendid weather the last month, and it still continues. The gardens are doing wonderfully well.

Yours, respectfully,

ANTON LARSEN.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GRAIN RIPPENED AT HOPE CITY.

HOPE CITY, COOK INLET, *October 20, 1901.*

DEAR SIR: I have experimented with most of the seed you sent to me, and have had fair success with everything I planted. I will send you a sample of the wheat, oats, and barley, as it grew; sown on May 20, and ready to harvest October 1. Our season was very late here, so consequently we could not say that everything had a fair chance. I will report more fully later.

I have cleared an acre this fall and plowed the same, and hope to surprise you next fall with the samples which I shall send to you at my own expense.

Respectfully, yours,

S. C. COLLINS.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

RIPE GRAIN AND LARGE CAULIFLOWER AT AFOGNAK.

AFOGNAK, ALASKA, *October 13, 1901.*

DEAR SIR: Half of the seeds you sent to me I distributed among the natives, except the barley, and the other half I used myself.

On April 15 I sowed the following seeds in a bed: Cabbage, celery, cauliflower, and kale. Set them out on beds June 4; cabbage and kale are on bed yet and growing. The cabbage is small, but passable. The kale is fine. Celery was a failure, on account of too close planting. The cauliflower is fine. The biggest head of cauliflower weighed $10\frac{1}{2}$ pounds and measured about 45 inches in circumference.

I sowed some tobacco seeds—"Connecticut Seed Leaf"—in a box. At the begin-

ning of June the plants were 3 inches tall, when I transplanted them in open ground. At the end of September I cut them down (almost 50 plants), and have them now in process of curing. The biggest leaves are 20 inches long without the stems, and the plants $3\frac{1}{2}$ feet tall.

As farmers in Finland grow tobacco successfully for their own consumption, I can not see any reason why we can not do the same in Alaska.

I sowed barley (Manshury) on May 23 on two beds. It commenced to show up June 1, headed July 27, commenced to bloom August 10. October 11, when I harvested it, the straw was still a little green, but the seeds were hard. The straw measured $3\frac{1}{2}$ feet tall.

Buckwheat (Silver Hull) seeded May 23. I raised the seed the previous summer. It came up June 5 and I gathered it October 11; matured only 10 per cent of the seeds formed after blooming.

Planted beans (Broad Windsor) May 23; they were blooming July 27, and blooming still. Plants are 4 feet tall and have pods on them; lower pods are full grown but green.

I sowed the following seeds from May 23 to May 26, besides those mentioned above: Onions (Yellow Danvers), parsley, cauliflower, rhubarb, peas, spinach, cucumber, parsnip, carrots, beets, kale, cabbage, mustard, clovers, sunflowers, caraway, sage, asparagus, lettuce, radish, turnips, ruta-baga, watermelon, and musk melon.

The biggest onion from seed measured $1\frac{1}{4}$ inches in diameter. The biggest parsnip measured $1\frac{1}{4}$ inches in diameter. The biggest carrot, $1\frac{3}{4}$ inches in diameter. The biggest beet, 4 inches in diameter. Asparagus is 6 inches tall at present. I was very successful with these vegetables, considering that the ground had been cultivated only one year.

I gathered a good lot of potatoes. It was a very bad year; the spring was late and very rainy, and the fall cloudy.

Yours, truly,

ALEXANDER FRIEDOLIN.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

EXPERIMENTS AT AFOGNAK.

AFOGNAK, ALASKA, *October 24, 1901.*

SIR: I received a great variety of seed from your station last spring, as well as the spring of 1900, and of these I have given the following trial: Romanow wheat, Manshury barley, Ligowa oats, Riga flax, red, white, and alsike clover. All were sown the 23d of May, in an old potato garden, the soil being a sandy loam, manured with kelp in the fashion it is generally done here for potatoes.

The three kinds of grain were doing surprisingly well up to the 10th of July, when cattle broke into the garden and ate off every straw clear to the ground. They grew up again very fast, however, and to my great astonishment I found the barley heading on July 24; the oats were a week later, and the wheat a few days thereafter; but the growth was stunted, of course, especially so with the barley, the straw of same not being any longer than just before it was eaten off.

On the 13th of October the barley was harvested; height about 2 feet, very even, fine heads, and seed ripe enough to germinate. On the last named date the wheat and oats were yet perfectly green, the former about 4 feet high and the latter 3.

The flax began blooming about July 24, seed nearly ripe October 13, height over 2 feet.

The clover was slow in making a start, but since it was once well up grew very fast, and the latter part of the summer the white and alsike clover looked as fine

as I have seen them anywhere, and I believe that the conditions of this region will agree with these varieties very well; but the red clover is uneven, comparatively short, and looks somewhat dried up, as though the soil was too poor for it.

In connection with my above-mentioned experiments, it must be remembered that last summer was unusually cold and rainy right through, and all planting here was two or three weeks later than ordinary seasons, where no very good results could be expected.

Very respectfully,

HERMAN V. SCHEELE.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

CATTLE DO WELL ON NATIVE FEED.

YAKUTAT, ALASKA, *November 14, 1900.*

DEAR SIR: I received last year at this mission a great many seeds from you. I have made a test of those I thought fit for the country.

I began to plant the seeds in May, and planted as much as I found time to. Some of the seeds did pretty well.

I raised fine cauliflower, cabbage, radishes, peas, lettuce, turnips, etc. Onions grow very small here, but my potatoes were large and ripened so well this year that I think I never saw better ones.

I think yearly more and more of stock raising as a business in Alaska. There are hundreds of places where grass is plentiful, and this coarse grass along the beach gives good satisfaction. It has done so for me for years back.

I keep four or five head of cattle and feed them on silage all winter, and they are all the time in good condition, and the cows give good milk. As Alaska develops there will be a growing demand for beef.

This country will soon come to the front and people will find many ways of making money in this part of Alaska. Here is plenty of fish, of course; but any one who has cattle to sell will surely find a market for them. The beef grown in Alaska is excellent.

A silo can be made very cheaply anywhere where wood is found. I made mine of boards only, and it answers the purpose very well. I do not think anybody in Alaska has better feed for cattle than my silage. I have had now beef here for nearly twelve years, and I can see a great change.

Respectfully,

(Rev.) ALBIAN JOHNSON.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

[The above letter came to me too late for last year's report.—C. C. G.]

NATIVES BEGIN TO RAISE GARDENS—LARGE DEMAND FOR SEED.

KENAI, ALASKA, *September 24, 1900.*

SIR: I will mention at the outset that we have had a very unfavorable summer. Long droughts in the spring (almost two months); cold winds. All this of course reflected upon our planting.

In regard to the cultivation of ground and planting of vegetables among the natives of Cook Inlet, I must say with great pleasure that a big step has been taken forward. Not more than three years back my parishioners, not excluding creoles, did not know how to eat lettuce, cabbage, and radishes, let alone planting any. They planted only potatoes and turnips, and this on a small scale. In some of the settlements, as Saldovia, English Bay, and Knik, there was not a single vegetable garden. At present

things are very different. Gardens have sprung up where there were none; where they were on a small scale, as at Kenai and Tyonek, they increased in dimensions.

The request for seeds is very great. What you have sent last spring was enough only for Kenai, Ninilchik, and Knik, so I was obliged to refuse people from the other four settlements. The natives of Kenai are very fond of turnips. We really need seeds by pounds and not by packages.

It would be positively a great kindness if the Government, once for all, would send some seed potatoes for some of our natives. They are very anxious to raise some potatoes, and thereby improve their material condition, but they have no seed and no money to buy any with. In this connection the Government would render the natives here a very great service, and by this better their condition and accustom them to the cultivation of vegetables. We hope, my dear Professor, that you will look upon our request with sympathy.

In conclusion we earnestly ask you to accept our sincere thanks and deep gratitude for your past kindness and attention to us.

Very respectfully, yours,

(Rev.) IVAN BARTNOFSKY.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

[The above letter arrived too late for last year's report.—C. C. G.]

FAIR RESULTS IN SPITE OF DRY SEASON.

TYONEK, ALASKA, *October 28, 1900.*

DEAR SIR: The present season has been extremely dry for agricultural purposes in many localities. At Tyonek during April, May, and most of July there was only about 3 inches of rainfall, and that was distributed so far apart that small seeds would not germinate. Many of the small seeds sowed in the latter part of April and first of May did not come up at all until the middle of August. Of those seeds that did come up, they made a rapid growth and matured early, considering the spring was bleak and cold. The general yield with me was the poorest in ten years, but other localities had better success. There was a fine vegetable garden raised 3 miles north of here. The mining camps of Sunrise and Hope produced excellent gardens; also the old trading station at Knik had fine gardens.

At Tyonek we had one cabbage to weigh $9\frac{1}{2}$ pounds, trimmed close. Turnips, carrots, beets, ruta-bagas, and potatoes were very fine in quality, and cauliflowers and celery also did well; but we had to sprinkle the latter with a sprinkling pot for nearly two months. Radishes and lettuce always do well.

The Indian gardens did not amount to anything, outside of their potatoes.

Very sincerely,

THOS. W. HANMORE.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

[This letter was received too late for last year's report.—C. C. G.]

GARDENING ON KNIK RIVER.

KNIK STATION, COOK INLET, ALASKA,

Via Sunrise City, October 12, 1900.

DEAR SIR: Your favor of July 17 just reached me. When you learn that the nearest post-office is about 80 miles from here, and that I have to go in a small sailing boat, in perhaps the most dangerous water on the coast for small boats, you may know that I take a trip only when necessary; so my mails are few and far between.

I have received no seeds yet, and it is hardly likely that another mail will reach me this fall, as navigation will soon close for the winter.

In regard to the seeds I planted last spring, will state that my knowledge of gardening is very limited, but have had very fair success so far. I have less than an acre in cultivation.

Parsnips are the finest and largest I ever saw, and the first I have heard of being raised in the vicinity.

Turnips grow to an enormous size, and of fine flavor. (Captain Glenn took a sample of my turnips last year to Washington.) This year my seeds were bad some way, as most of them went to seed. I don't know the reason why.

The Scotch kale is a perfect success here. Two men who came here from where it is raised extensively say it was the finest they ever saw.

Cabbage is small, but heading fast at present. They have heads about the size of a pineapple cheese, and are of a fine flavor.

Ruta-bagas are large and fine; have just taken mine into the root house. I had some so big that three filled a 30-pound candy pail.

Lettuce, peas, radishes, cauliflower, and potatoes are a success.

I made a failure of cucumbers, tomatoes, spinach, and parsley, and a partial failure of onions, but I think they could be grown from seed.

The natives above raised some potatoes, turnips, kale, cabbage, cauliflower, parsnips and radishes. They are very anxious to learn. I am a very poor teacher, as I must learn myself before I can teach others. Instructions about planting should go with all the seeds you send out. Some of my failures were due to my inexperience.

Yours, truly,

G. W. PALMER.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

[Received too late for last year's report.—C. C. G.]

LARGE TURNIPS—INDIAN GARDENS.

KNIK, COOK INLET, VIA SUNRISE, ALASKA,

October 15, 1901.

DEAR SIR: Agreeable to your request I will send you a report of the seeds I planted last spring. These were the seeds you sent me a year ago. The seeds you sent me last spring were received too late for planting, so I did not try the wheat, oats, or clover seed.

The seed you sent me a year ago reached Tyonek too late to be forwarded by boat, and I had to send a native after them overland (about 100 miles or more). I have about one-sixth of an acre under cultivation and have not used any fertilizer; of course, the work has all been done by hand. I spaded the ground May 14 and 15. May 18 and 19 I planted potatoes, ruta-bagas, onions, turnips, parsnips, radishes, lettuce, beets, carrots, asparagus, peas, and mustard; of these all except the potatoes were in narrow beds. On May 30 I transplanted cabbage and cauliflower, and planted some cucumbers and beans.

Cucumbers, beans, mustard, asparagus, and onions were a failure because of dry weather. Radishes were destroyed by a white worm, which goes into the root and lives there until it is eaten up.

Lettuce, cabbage, cauliflower, and kale were not a good crop on account of dry weather in the spring. No rain fell here until July 5. I have to carry water a long way, so I do not water my plants at all.

The potatoes, turnips, parsnips, and carrots yielded well. I have 30 bushels of potatoes as fine as ever raised anywhere. One turnip weighed $17\frac{1}{4}$ pounds.

I have more than sufficient of all kinds for the winter.

Of the seeds you sent me, I gave what I did not plant myself to the natives here, and some of them raised some very good gardens, for the first working of the ground. I will give the grains a trial next year.

Clover and timothy I know will grow here, as it has come up where Captain Glenn had his hay piled, when he wintered his stock here, and is still growing, which proves that it does not kill out in the winter.

Should you send me some more seeds I will do the best I can with them. It will be a material help to the natives here to get them to raising gardens, as game seems to be getting scarcer every year, and unless the Government gives them some assistance they will, before long, have a hard time to live.

Thanking you for your past favors, I remain, yours, truly,

G. W. PALMER.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

REPORT FROM SUNRISE.

SUNRISE, ALASKA, *October 25, 1900.*

SIR: Last spring I received a package of garden seeds from you, and a circular requesting accounts of the results obtained from efforts of gardening in this vicinity.

Owing to inexperience or ignorance, only the cabbage, turnips, peas, and potatoes turned out middling well. The cabbage formed heads weighing from 8 pounds down. One of the turnips measured 2 feet $\frac{1}{2}$ inch in circumference and weighed 8 pounds, all of first-class quality. The peas and potatoes did very well; particularly those planted from seed of last season came up and blossomed two weeks earlier than those from seeds obtained from the States, which would seem to indicate an advantage in planting seeds grown in Alaska.

The land is new, and three years ago was covered thickly with spruce timber, stumps measuring from 1 to 2 $\frac{1}{2}$ feet in diameter. Soil thin on top of gravel and boulders. Fertilized mainly by wood ashes, particularly where the large stumps were burned out.

The experiments will be continued on an enlarged scale next year. It is intended to manure the lands with horse dung, and plant onions, parsnips, carrots, beets, cauliflower, and kale, in addition to the vegetables that flourished in the patch this year.

A. LARSON.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GARDEN SEEDS PLANTED AT COAL HARBOR, UNGA ISLAND, ALASKA, IN 1900.

COAL HARBOR, ALASKA, *October 24, 1901.*

DEAR SIR: Herewith please find my report upon the seeds which you sent me. Gardening with us is an old business. Some of your seeds did not do as well as they should have done, being perhaps not of the very best. The best of all would perhaps be those seeds raised from the soil where they are to be replanted. This is particularly true of potatoes and turnips. Your kale was a perfect success, continuing well into the winter months. Yearnings toward muskmelons and cucumbers are utterly hopeless, however. With us corn has proved a failure, but on the other hand, barley has matured and did well.

No. 1. Turnips, planted May 12, above ground May 21, harvested August.

No. 2. Kale, planted May 20, above ground June 1, harvested August.

No. 3. Radish, planted May 20, above ground June 1, harvested June 18.

- No. 4. Parsnips, planted May 20, above ground June 2; destroyed by rats.
- No. 5. Carrots, planted May 21, above ground June 8, harvested October 1.
- No. 6. Potatoes, planted May 6, above ground June 21, harvested October 21.
- No. 7. Lettuce, planted May 24, above ground June 5, harvested August 10.
- No. 8. Cabbage, planted May 24, above ground June 8, harvested October 16.
- No. 9. Onions, planted June 2, above ground June 15, harvested October 5.
- No. 10. Cucumbers, planted May 20, above ground June 12, and died in a few days.
- No. 11. Muskmelons, planted May 20; did not come up.
- No. 12. Buckwheat, planted September, 1899, in rich and carefully prepared soil.
Did not come up.
- No. 13. Parsley, planted June, up in fifteen days; now in the ground, and doing well.

Remarks.

- No. 1. Early White Milan variety. Well adapted to this soil and climate; grew quickly, and matured in forty days, and of good size. Cox Improved Yellow Ruta-Baga variety in the same soil, grew slowly; have not yet (October 23) matured, and have proved unsatisfactory. The Golden Ball always do well.
- No. 2. Dwarf Green Curled Scotch variety has done exceedingly well; fit for use in sixty days after planting, and is still growing, and looking well.
- No. 3. A perfect success. The white variety preferred.
- No. 4. Thorburn Hollow Crown variety; slow growing; perhaps old seed.
- No. 5. Chantenay variety. A success every way.
- No. 6. California seed, Burbank. Fully matured; ripe and mealy; native seed comes up two weeks sooner.
- No. 7. California seed, Prize Head, variety from E. J. Bowen, California, is the best, and last into winter.
- No. 8. Early Winnigstadt variety. Quick growers, and large, but all leaves; would not head; not adapted to this climate. Small Drumhead being much better.
- No. 9. Large Red Wethersfield. Do not mature except as green onions for table. Bottom sets do better.
- No. 10. Early Green Prolific variety. At 1 inch above the ground died; climate too cold.
- No. 11. Banquet variety. Seeds did not come up.
- No. 12. Triple Curled variety. A perfect success.
- No. 13. Buckwheat. Last year (1899) planted in the month of June; it grew well; height, about 2 feet. Flowers many and large, but did not pass beyond that stage. The attempt at fall planting was a total failure. Barley will grow and mature in sheltered places.

All of the above seeds were planted in the open without any forcing. The soil was composed of sandy loam, well fertilized with barnyard and stable manure, deep spaded. Under cultivation for some years. Our surplus seed was distributed to whites and natives in the neighborhood. Thus far no reports from them have reached us.

HENRY S. TIBBEY.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

ROOT CROPS DID WELL.

SAND POINT, ALASKA, *September 13, 1901.*

DEAR SIR: The package of seeds which you sent me this spring was duly received, and can now tell you something of the results.

All the root vegetables were planted on May 22, in newly broken ground with very

little fertilizer. They have all done well save the onions, which have not amounted to much.

Of the oats, wheat, and barley I planted them in old tried fertilized ground, and also planted ordinary California chicken feed wheat in the same ground.

The California wheat beat all the other seeds, that being fully headed, and about 4 feet high when I cut it. I have made ensilage of that wheat, and also made the same amount of ensilage of our native grass, and shall watch for results now as to the relative values of the two for that purpose. I will let you know as to what the outcome is.

Very truly, yours,

H. BOETT.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

REPORT FROM ROLL BROTHERS HOPE CITY.

HOPE CITY, COOK INLET, ALASKA, *April 8, 1901.*

DEAR SIR: Your seeds mailed February 28 came to hand April 24. We herewith send you the following report concerning our gardening in the season of 1900.

Carrots.—Parisian Forcing and Half Long Chantenay. The Half Long Chantenay did not germinate because the ground must have been too cold. Both kinds again sown May 25, coming up June 14. A 130-foot drill row produced 60 pounds medium carrots on two-year-old good soil. Parisian Forcing proved to be about 25 pounds more productive than the other kind on the same soil and bed. Sandy rich soil proves best for carrots in this part of Alaska.

Beets.—Extra Early Eclipse Blood Turnip, and Early Bassano Blood Turnip, and Early Blood Turnip. The first-named were sown May 8, in drills, and the two other kinds were sown May 24, also in drills; 468 feet of row produced 152 pounds merchantable beets. Extra Early Eclipse proved to be the best. Early Bassano produced large tops and shaded the ground too much, therefore not good for Alaska. Beets weighed from $\frac{1}{4}$ to 1 pound.

Beans.—Extra Refugee, planted in June, seeded $\frac{1}{2}$ pound in a 100-foot drill, on three-year-old sandy soil; had blossomed by August 1, and by August 29 they were damaged some by the frost, and produced only 1 pound very small pods September 10.

Cabbage.—Early York, Early Summer, and Late Flat Dutch. The last-named did not get solid. The season is too short for a late variety. Seed sown in a box in the house came up April 1. Seed sown in hotbed outdoors March 27 came up April 13. Cabbage transplanted May 25, June 5, also June 13. Altogether 482 plants produced 972 pounds of cabbage (merchantable cabbage). Thirty of the late kind proved to be a failure. Thirty or forty of the early kind did not head or mature. On May 28 we had a heavy snowfall, about $1\frac{1}{2}$ inches, which did a good deal of damage to the plants.

All plants were set 3 feet apart each way, and we had marked the first matured cabbage on the 14th day of August.

August 14, weight of cabbage as follows: 1 head, 2 pounds; 24 heads, 80 pounds; 5 heads, 16 pounds. September 15, 1 head, 8 pounds; 1 head, 6 pounds (3 weighed 17 pounds); 1 head, 5 pounds. December 13, weight of 41 heads, 164 pounds (made into sauerkraut). Each 4 pounds. The last week in October the weather was getting too cold for cabbage. We have had about 450 pounds in our root house. The house or cabin was made of a double log wall, filled in between with 18 inches of earth. The frost penetrated in the early part of the winter, therefore we had to keep the cold out by artificial heat. We have weighed the cabbages whenever we have disposed of any of them. At this writing we have on hand 17 heads.

The following are the directions we have used in growing our cabbage plants. We take a box from 15 to 20 inches deep; put 5 inches or more of fresh horse manure in the bottom, pack it close, and next 5 to 6 inches good, rich, old soil. Sow your seed and cover with very little moist soil. Have a window or glass to cover the box with, so no warmth can escape from middle of box. Keep the box outdoors, any place, but better on the south side of the building. Cabbage seed sown in this way will come up in ten or twelve days, even if the nights are from 10 to 16 degrees below freezing. To make good, hardy plants, keep box open if the weather is too warm.

Cauliflower.—Early Snowball transplanted the same time as cabbage in good, heavy, moist soil. They grew to the size of a dinner plate. The heads are firm and of excellent flavor. Cook Inlet, the garden spot of Alaska, proves to be the home for cauliflower.

Celery.—White Plume; seed sown in a box outside March 25, and transplanted June 15. The seed did not germinate very well and we obtained only about a dozen plants. I transplanted mine in very rich four-year-old soil. The stalks proved to be of medium size.

Kale.—Proved to do very well here.

Lettuce.—Does very well here in rich, moist soil.

Onions.—They have been a failure up to this time. We have noticed a fly, or mosquito, which kills the tops of the onions from 2 to 4 inches downward, and two or three flies will be found dead on the tops of each onion. The mosquito does much damage to the growth of the onions. No doubt if the proper onions can be obtained for this climate maybe they would grow here, as the flies and mosquitoes are not any more numerous than they have been since 1896.

Potatoes.—Early Rose and White Burbank, planted May 7 and again May 20. Fifty pounds of seed were used on a space of 77 by 32 feet on new, sandy soil, and produced only 568 pounds of potatoes. We have planted from 100 to 110 pounds potatoes other years, and we have had yields of from 1,900 to 2,000 pounds. Potatoes have produced only a small crop in 1900. The reason for this was most likely the dry weather. We had 1½ inches of snow on May 28. In June and also the beginning of July it was too dry for potatoes planted in sandy soil. The potatoes attained the size of from 8 to 18 ounces, but they were a little watery.

Parsnips.—Hollow Crown. They do about as well as carrots. One hundred and thirty feet drill row produced from 45 to 50 pounds of medium size.

Radish.—Early Scarlet Turnip, White Tipped, and Olive Shaped. The early turnip or twenty-eight day radish grows well here. The Half Long or Long Radish, also called Four Weeks Radish, never has proved to be very good, except late in the autumn whenever it is cold with a good deal of rain.

Tomatoes.—Atlantic Prize Extra Early. Grown in the following way: We put the tomato seeds in the same box we grew our cabbage plants in, after the cabbage plants were removed. We kept the box covered with a window at night and cold days until the tomatoes attained the height between the earth and the glass. In this way the tomato vines have grown 3 feet high, and the fruit as large as a goose egg. The fruit did not ripen, only attained a light golden color. After keeping in the house for three or four weeks the fruit was purplish red.

Turnips.—Early White Milan, and Purple Top White Globe. Were sown May 7, came up May 20. Two hundred feet of drill produced 612 pounds on poor sandy soil. The Purple Top White Globe will get as large as from 12 to 15 pounds if not seeded too close, and it is also a good keeper. Turnips can be sown early in the spring, and the last week in June or the first week in July again. We have marketed turnips July 25. At this date they weighed 9 ounces and over.

We also will try early corn this summer.

Ruta-bagas.—Yellow or Swedish Turnips. Sown May 24 and came up June 10.

Two hundred and eighty feet of drill row produced 488 pounds. They do as well here as in the States. They attain a weight from 1 to 8 pounds, and as a rule they will average about 3 pounds.

Yours, truly,

ROLL BROTHERS,
General Merchants.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

FARMING ON THE NUSHAGAK.

MORAVIAN MISSION, NUSHAGAK, ALASKA, *August 4, 1901.*

DEAR SIR: I will drop you a few lines at this time to let you know that the thermometer and rain gauge came to hand safe and sound. I have as yet not set them up, as I have been very busy with fish catching, gardening, and haymaking, besides very many other duties; not the least of which is the post-office, of which I have charge. I shall endeavor to set them up and take records by September 1.

The seeds came all right. Some were planted, while others were kept over for next spring.

Thus far, this has been a remarkable summer, the like of which I have not seen in the five years of my Alaska life; dry and hot, so that often one felt like keeping still and cooling off.

It took a long time for the seeds to germinate, but they finally did, and now the gardens are a beautiful sight. We have very little competition in that line, so we have praise from visiting parties. We are, however, not the only ones who try to raise vegetables, as quite a number of our neighbors have gardens, and a few natives. The white settlers are all fishermen, and at the time when gardens need most attention they must be on the river catching fish. The natives, too, have spent what time they might devote to it in drinking and being "all same white man."

Everything planted seems to be doing well. Even the corn woke up during the warm weather, and if we had had some warm rain it would likely have come to something this year. I don't believe, however, that corn will do well, as a rule, here.

While I was attending to fishing, etc., the sisters waged war against the worm, which spoiled so much of our underground crop; first, wood ashes were put to all turnips and the like, but still they came. We then brought some lime from the cannery and each stalk was trenched around and a liberal pile of lime placed at the root. This checked the worms to some extent, but some go through even lime. When we dug the garden we put considerable lime on. It seems that these worms are possessed of constitutions to stand any test Alaska can furnish.

I dare say you will be interested in the growth of the grains you sent me; they are doing fine, I think. They were all planted on or soon after May 15. On account of the dryness they did not spring up very promptly, but I think most of them will mature and ripen this year. The Romanow wheat is just splendidly loaded; the oats are also doing well, but a little behind time. I have barley from a Dakota farmer which beats anything I have yet seen. Wheat (spring) from Dakota is headed, but I am afraid not as heavily as it does in its native State. I have Pennsylvania oats which is about on a par with the other.

I have sown two beds of clover, red and white, which are doing nicely, but at this writing I see no signs of blossoms. I hope it will yet mature, as clover is one of the grasses I much desire to have. I wonder how timothy grass would do here?

At last I have a cow (calf). At one of the canneries they had a cow which gave no milk, and in due season she had a calf. The men wanted to kill it at once, so they might the sooner have milk. I asked to be allowed to raise it, so am

teaching it to drink out of a bucket. It is now a week old and just begins to drink nicely. The cannery men were generous enough to give me a few quarts of milk each day, so that with a little scalded meal the calf has been faring pretty well.

I have made quite a little hay, and would have more of what I made first if it had not made me so much trouble. I think I must have put it in a little too soon, as it got too hot and molded. I had to throw it all out and dry it over, which took several days. The result is that my once fine hay is now second class. And just to-day the weather changes, and rainy weather is upon us. I think I may have a few more days of fine weather. The grass is getting very hard and coarse now.

I will not be able to build a silo this year, but hope to build a log barn as soon as I can raft the logs home. If the rains prevent any more haymaking, I will have to be satisfied with a hole in the ground for my silo.

I have tried to make use of some of the fish refuse (heads and backbone), but I am afraid my way is too offensive. I hauled a lot to the barnyard, and covered it with manure, but the flies soon had it in a terrible mess. I have heard that fish makes a good fertilizer, but I guess that I do not use it right. Can you give me advice as to how to use it?

Yours, truly,

(Rev.) S. H. ROCK.

Prof. C. C. GEORGESON.

[Work the fish refuse into the ground before it decays.—C. C. G.]

MORAVIAN MISSION, NUSHIGAK, ALASKA, *August 29, 1901.*

DEAR SIR: I will add a few lines to what I have written under an earlier date. How I wish you could have a look at our garden. Everything is tropically inclined, I think. We have made a nice barrel of sauerkraut, and greens of all kinds have been our bill of fare for weeks.

I hope to harvest a good crop of potatoes, celery, peas, beets, and ruta-bagas. The cauliflower was lovely this year again. The lime treatment for turnips seems to have been quite a good one.

All the grains and grasses are doing splendidly, only I fear the rainy season which is upon us will hinder their full development. The barley from Dakota has fallen flat on account of heavy weight. The Romanow wheat stands all of 5 feet and is heavy with grain. The Dakota and Pennsylvania oats are also ripening.

The clover is now in blossom, but I don't think the seed will ripen; time will tell.

I sowed a bed of winter wheat which is well started now, so by next spring we will be able to report on it also. The straw of all these grains is extra heavy and of a deep green color. The Dakota wheat and Pennsylvania oats are a little behind the others.

I would like to ask what is the reason of the cabbage bursting before the head has attained any size? Many of our cabbages had to be cut on that account.

The sugar-peas planted by the sisters stand $6\frac{1}{2}$ feet, and are just as full of peas as they can hang, and new blossoms are coming every day.

The American Wonder and Little Dandys are also yielding well. I think a sprinkle of lime has perhaps helped them some. They were planted on the bed where I had barley and oats last year.

If I were not so busy I would take a picture of the garden for you; may do so later.

My stock is getting along nicely. The chicks are growing nicely and the calf is beginning to nibble grass. The cow took sick a week ago and had to be killed, as nothing could be done for her. She began by limping in her right hind foot, and

someone said she had gotten foul of her rope and thrown herself and that the dogs then bit her. The dog bites, however, were very slight.

Well, I will have a litter of pigs in a few weeks, then my troubles begin anew.

Yours, truly,

(Rev.) S. H. ROCK.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

CARMEL, NUSHAGAK RIVER, *June 5, 1901.*

DEAR SIR: The vegetable seeds that you wrote you had sent to me on February 28 arrived here June 18. Very many thanks for the same. I will be able to use only the radish and lettuce seeds this season and they are already in the ground. The others I will give a good trial next year. I also planted part of the rhubarb seeds; they are just showing, but I will watch them closely and try and raise some good ones.

The flower seeds you sent me in February I sowed also. Only the nasturtiums, pansies, and pinks have as yet come to any size, in fact most of the others are not up at all; although the phlox, poppies, petunias, and alyssum and larkspur look as though they may yet grow nicely. I hope to have some asters and mignonette for next spring. The Tom Thumb nasturtiums have done finely and are in bloom.

In looking over the seeds and list I find that there is no cauliflower. As I understand from several other parties that you sent snowball cauliflower seed to them, I feel somewhat disappointed. I have heard from parties passing through here that they are such a fine strain, and I would like to try them, but I can not get seed from Philadelphia in time for next year. I will carefully tend them and report at the end of the season.

Very truly, yours,

P. C. KING.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

FLAX, BUCKWHEAT, AND BARLEY MATURED AT TANANA.

ST. JAMES MISSION, TANANA, ALASKA, *April 27, 1901.*

DEAR SIR: Thanks for seeds. Will keep you posted as to what is accomplished this year. I raised last year turnips, Purple Top, $9\frac{3}{4}$ barrels from the seed sown in June, and pulled in early September the flax, buckwheat, and wheat and barley. All matured, but the stalks were very small and weak.

Yours, truly,

ALFRED A. SELDEN.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

RADISHES, TURNIPS, AND LETTUCE ON KOTZEBUE SOUND.

KOTZEBUE, ALASKA, *April 22, 1901.*

DEAR SIR: Your favor of last year was received in August, 1901, consequently we have not tried the seeds. We will try this present spring, and report the results to you. With our own seeds we have only been successful with radishes, turnips, and lettuce, but think with hotbeds other things might be a success.

Yours, respectfully,

ROBERT SAMS (Missionary).

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GARDENING A FAILURE AT POINT BARROW.

EAGLE, ALASKA, *July 25, 1901.*

DEAR SIR: I tried some of the seeds sent me to Point Barrow, but all results were negative. The plants grew, filled the windows with a beautiful foliage, blossomed, and died; at no period was anything edible apparent.

It is impossible to plant outside, as on the evening of the hottest day it is apt to be below freezing.

However, if more seeds are sent, I will do my best to raise something. We did not try anything but radishes and lettuce, and the latter never appeared at all.

I am on my way in after a year on the outside.

Sincerely, yours,

(Rev.) H. R. MARSH.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

DISTRIBUTION OF SEEDS.

During the past year, as heretofore, hardy garden seeds, a few flower seeds, and some early maturing grains have been distributed to persons residing in the Territory who either had made application for them or who seemed likely to take an interest in their culture. This seed distribution may be regarded as legitimate experimental work. The recipients become cooperators with the experiment stations, and frequently their experience is valuable, in that it may point to a general truth. Moreover, this distribution of seeds stimulates the development of agriculture. Many people who would not have made gardens or attempted to raise crops except for the timely arrival of seeds have been induced to do so, and their example has influenced others to apply for seeds and to attempt the growing of vegetables or grains. The result is that there are gardens in hundreds of places where there otherwise would not have been any. Brief directions on their culture are sent out with the seeds for the benefit of those who have had no experience in that line, and correspondence on the subject of the cultivation of crops of every kind has been solicited and is promptly attended to.

The foregoing letters are samples of the reports which are received at the station bearing on this subject. This distribution of seed has also had the effect of encouraging the natives to engage in gardening. It is true that as yet results are but limited, but we are casting bread upon the waters, and we shall see results later on. The Indian, as a rule, has a good stock of hard common sense. When he sees that by cultivating a little patch of ground he can raise a few bushels of potatoes or turnips or anything else which will help him to eke out an existence, he is, as a rule, not averse to trying the experiment. The Indian is not an enterprising character, and probably but few of them will ever become farmers in the proper sense of the word, but his food supply in most parts of Alaska is gradually diminishing, and he is aware of this. Many settlers, as well as some of the missionaries, have expressed the view that the Indian must either take to the cultivation of the ground in order that the products of the soil may help him to obtain

a living, or else he will be a Government ward and maintained in whole or in part by the Government, if indeed he is not left to starve. The former alternative is, of course, the more preferable, and this distribution of seed is an aid to that end. For assistance in this work I depend wholly on missionaries and on well-disposed white men to whom the seed is sent and who are requested to share with the natives in their neighborhood and to instruct them how to grow the seeds. I am glad to say that many of the white people take an interest in this matter and go out of their way to help in the work.

A few flower seeds were purchased and distributed for the first time last fall. These seeds were highly appreciated, and, as a rule, they have been cultivated with much success. They have helped cheer many a home in the wilderness, and to that extent have been of real service.

I have also distributed small packages of early maturing grain, more particularly of barley and oats. Some of this grain has been sown in regions where grain had never been grown before, as, for instance, on the Tanana and in the Copper River country, and in some cases seed has been matured in spite of the fact that the ground has been new and raw. These are experiments of real value.

I recommend that the distribution of seeds be continued, and if possible extended.

The following is a copy of the instructions I sent out with the seed:

UNITED STATES DEPARTMENT OF AGRICULTURE,
Office of Experiment Stations, Sitka, Alaska.

GENERAL DIRECTIONS FOR CULTURE.

As a guide to those who have had but little experience in growing vegetables and grain in Alaska the following suggestions are offered:

(1) As far as practicable use old ground, that is, ground which has been under culture for some years. New ground is almost invariably unproductive. It lacks available plant food and it is too sour. The seed will germinate in such soil and the young plants appear above ground, but they make but little growth, and in the course of two or three weeks they turn yellow and die. The climate is often erroneously blamed for failures of this kind.

(2) When new ground must be used its defects can in a measure be remedied by a heavy application of some good fertilizer. Fish guano has proved to be of much value at the Sitka Experiment Station for this purpose. It should be applied at the rate of about 300 pounds to the acre. Seaweed thoroughly worked into the ground is also good. Likewise stable manure and chicken dung. A dressing of quicklime will neutralize its acidity and be especially helpful to such plants as peas, beans, and the clovers.

(3) See that the ground is thoroughly drained. If good drainage can not be secured in any other way, raise the beds a foot and make them 3 feet wide on top and sow 2 rows of seed on each bed.

(4) Avoid thick seeding. Sow thinly in rows 2 feet apart and cover lightly. Thick seeding is not only a waste of seed, but crowded plants can not develop normally.

(5) The rows should run north and south to give the sun a chance to warm the ground between them.

(6) Stir the ground between the rows at least every two weeks, and pull all weeds when they appear.

(7) When obtainable, use fertilizers freely on old ground as well as on new.

SPECIAL DIRECTIONS FOR CULTURE.

Asparagus.—Sow in rows 2 feet apart in early spring and on very rich soil. Preferably the rows should be dug out 6 inches deep and filled with old manure before seeding. Stir the ground frequently during the summer. Late in the fall cover the plants with long manure or with hay or straw for winter protection. If the following spring the plants are strong and of good size, they can be planted out on a permanent bed; if weak and small, let them grow in the seed bed for another season and transplant them the spring following. Make a bed 3 feet wide on well-drained ground. Dig the earth $1\frac{1}{2}$ feet deep, and in so doing work in a layer of stable manure a foot thick. This will raise the bed a foot. Set two rows of plants $1\frac{1}{2}$ feet apart in the rows and 4 inches deep. The second year thereafter some of the more vigorous shoots may be cut. Seaweed can be used as a substitute for manure. Cover the bed every fall with manure or seaweed, and work it in in the spring, taking care not to injure the roots. The shoots will be small and spindling unless the soil is rich.

Beans, wax.—Plant in a warm, sunny place in rows 2 feet apart, but not until settled warm weather begins. They can not be counted on to produce edible beans unless grown in a dry, warm place.

Beans, Windsor.—Drop beans 4 inches apart in a row late in the spring. They are hardier than wax beans and will be successful in Alaska in all ordinary seasons. The beans are shelled and used as Lima beans when nearly full grown. They are quite equal to the latter in flavor.

Beets.—Sow very thinly in a row in early spring. When 2 inches high, thin the plants to 4 inches apart in the row.

Carrots.—Sow very thinly in a row in early spring; thin the plants to 3 inches apart.

Cabbage.—Fill a box 6 inches deep with rich, old soil and set it in a sunny window in the house. Sow the seed thinly in this about the 1st of April. Keep the plants watered and give them all the light possible. As the spring advances set the box out in sunshine during the day and shelter it at night and finally leave it out altogether. If well cared for, there will be nice plants ready to plant out about June 1. Plant on rich soil, $2\frac{1}{2}$ feet apart each way. A cold frame, or, better still, a hotbed, can of course be used to raise the plants in instead of a box.

Cauliflower.—Same as cabbage.

Celery.—Raise the plants as directed for cabbage, except as follows: The seed is very fine. Sow it on the surface of the soil and cover it very lightly with sandy earth sifted over it. The plants grow slowly, but will be ready to set out by the middle of June. Set them 4 inches apart in a row, on especially rich and well-prepared soil. Blanch the stems by drawing the earth about the plants about the middle of September. Protect from early frosts.

Cucumber.—Plant seed in small pots (two seeds in a pot) in April. Keep in a sunny window or in a hotbed. Harden plants gradually during latter part of May. Plant out on rich soil in hills 2 feet apart in June. Be sure that the earth is not knocked from the roots in turning the ball out of the pot. The plants will not grow if the roots are disturbed. Cucumbers can be planted in the open in the latter part of May, but they are less certain of success than by the above plan.

Kale.—Treat as directed for cabbage and cauliflower.

Lettuce.—Sow a little in a box in early April and transplant when warm enough. Sow outdoors in May. Transplant to 6 inches apart.

Mustard.—Sow in a row in early spring and cut it for greens. Allow some of it to go to seed to supply seed for next year.

Onions.—Sow very thinly in a row on warm, well-drained soil as early as the ground can be worked. Some of the reasons for failure are too thick seeding (the plants should be at least 3 inches apart), too poor soil, and poor drainage. Save the small onions and use them for sets next year.

Parsnip.—Treat as directed for carrots; but they need more room. Plants should be at least 4 inches apart in the row.

Parsley.—Sow thinly in a row. The leaves are used for garnishing and flavoring.

Peas.—Plant in rows in early spring. Support vines with short, bushy brush.

Radish.—Sow a little in a row once every ten days from the opening of spring.

Rhubarb.—Sow thinly in a row on rich soil in early spring. Let the plants remain over winter where they grew, but protect them with a layer of hay, straw, or long manure. The following spring plant them out in some sheltered corner of the garden 3 feet apart each way on rich, well-prepared ground. With liberal manuring, winter protection, and working of the soil in summer they will last a dozen years.

Spinach.—It requires rich, well-drained soil. Sow about the middle of spring in a row.

Turnip.—Sow thinly in early spring and again about the first of July. Don't let the plants crowd each other.

Ruta-baga.—Sow thinly in rows, in early spring, and thin the plants till they are 9 inches apart.

Red clover, white clover, and Alsike clover.—A small package of each of these clovers is sent out to test them in Alaska. Sow thinly on well-prepared ground. Protect from animals. Note if they live through the winter, and if so let them go to seed and note if the seed matures. Do not mix them nor sow them with grasses of any kind.

FIELD GRAIN.

A small amount of field grain will be distributed consisting of Romanow spring wheat, Manshury barley, and Finnish Black oats and Burt Extra Early oats. These grains are sent out with a view to test their adaptability to different regions of the Territory. Those who receive them are requested to give them a careful trial on good soil. The general directions as regards soil which are given above for the culture of vegetables should be observed. Only a very small quantity of seed of each can be supplied, and it is recommended to sow it in rows 2 feet apart and hoe the rows as in the case of vegetables. Sow them as soon as danger of severe frost is over.

Romanow spring wheat.—This is the earliest spring wheat which we have so far tested at the Sitka Station. It has matured wherever tried in Alaska. It has a good straw, fine heads, with brown chaff and short beards. It was imported from northern Russia by the United States Department of Agriculture.

Manshury barley.—This variety is one of the earliest tested and has never failed to mature wherever tried. It is quite commonly cultivated throughout the Northern States.

Finnish Black oats.—The seed sent was imported from Finland in the fall of 1900. It has not been tested in Alaska, but it is believed to be as early as any variety known.

Burt Extra Early oats.—This is a variety which has matured in Alaska wherever tried. It is grown to a limited extent in the Northern States.

SAVE THE SEED.

Those who succeed in maturing these grains are earnestly requested to save the seed and to continue growing them year by year in order to obtain a stock of Alaska-grown seed. The Romanow spring wheat and the Finnish Black oats can not be supplied again.

C. C. GEORGESON,

Special Agent in Charge of Alaska Investigations.

DISTRIBUTION OF TREES AND PLANTS.

I strongly recommend the distribution of trees and plants along the same lines and for the same purposes that the seed is distributed. If it is difficult for settlers to get seed under the present conditions, it is ten times more difficult for them to get plants and trees. We do not know what kind of fruits can be grown in Alaska because none has been tried. There is an old apple tree at Sitka planted by the Russians upward of forty years ago and a young tree at Wrangell. Both of these bear fruit every year, but the fruit is of inferior quality. They are the only fruit trees of bearing age I have heard of. It is of vital importance that experiments should be made in many different parts of the Territory in order to determine the possibilities in fruit growing and the delimitations of the fruit belt, if, indeed, there is one. To do this, I propose, if my plan is approved, to establish a nursery at the headquarters station, propagate all kinds of hardy fruits and send out trees and plants in limited numbers and under proper restrictions, to settlers free of charge. By this means numerous tests can be made and valuable information secured. Moreover, it will help the development of the Territory. The expense would be but a small matter to the Government, but it would mean a great deal to the pioneers. The work should be begun at once. We are ready to take it up if the appropriation makes it possible. If this feature is added to the experiment station work, it will require about \$2,500 additional appropriation to procure a modest stock of trees to begin with, to pay for freight and labor, and to pay the salary of a competent, active propagator for one year.

WHAT THE DEVELOPMENT OF AGRICULTURE MEANS.

The development of agriculture in Alaska means the settlement and development of the Territory. The one line of growth is synonymous with the other. It means the building of homes, a permanent population, a powerful aid to the development of the mineral resources, the creation of wealth, and the building of a state. The mineral resources of the Territory have not been fathomed. We only know that they are vast, and that it must take a long time to exhaust them. But great as is this hidden wealth, it can not build a state unaided. If agriculture can not be, or is not developed in the Territory, Alaska must forever remain what it now is—a distant mining camp, with its base of supplies on an average nearly 2,000 miles away. The population would shift and dwindle in the placer districts with the exhaustion of the mines. Permanent settlements could be possible only in quartz mining districts, and the mines would of necessity be owned by capitalists who probably would not live there. Alaska would then be a place where the poor man could live only as the servant of the rich. If a pros-

perous and sovereign state could be born of such conditions, it would be the first instance in history. The argument has been advanced that the development of agriculture would prejudice the mining interests. Such an argument is illogical and untenable. On the contrary, it would be of the greatest possible advantage to mining; it would reduce the cost of living, labor would be more plentiful, interior roads would be built, transportation facilitated, the country would be better known, and, therefore, capital for development would be more easily obtained. Nor is mining the only industry which would be benefited. The wants of the settlers would increase the business of the merchant, there would be a greater demand for transportation, the larger the population the greater would be the trade with the coast ports, the resources would be developed, and a powerful state would be added to the Union.

WORK OF THE PIONEER.

Alaska is settled by pioneers. It is the work of the pioneer which has brought her resources to light and which enables her to help in enriching the world. If Alaska ever becomes great and powerful, if the constellation of the flag is enriched by the addition of a star which shall represent Alaska, it will be due to the work of the pioneer. And by pioneer I mean not only the prospector and miner, farmer and fisherman, but also the merchant, the missionary, the mechanic, and all who by their efforts assist in the great work of development. If an agricultural industry worthy of the name is developed in the Territory, it will be due to the pioneer. His task is an arduous one. In addition to the privations and hardships which are always incident to the subduing of a new country, he has to battle with a climate which is inhospitable during a large portion of the year; he is far from home and kindred; the expenses which he has to meet for transportation and supplies are excessive, and he has to face great personal hardships. The Government has spent, and is spending, great sums in erecting military establishments in various parts of the country, all of which, of course, is an aid to its development, but the work of the pioneer is of still greater value. The writer would respectfully submit that it would be to the advantage of the Government to facilitate and assist him in the work in every way possible. Whatever facilitates the work of the pioneer goes to the benefit of the Government—it is returned in the development of the Territory. From the standpoint of the development of agriculture, I would respectfully submit that greater forward strides would be made, more would be accomplished, and the Government would, in the end, be the gainer, if the law permitted settlers to go in, and, under proper restrictions, take up 320 acres, or even only 160 acres, without cost and without the restrictions which now make it impossible for the poor man to get title to land.

SURVEYING LANDS.

The first and indeed the most essential step in the development of agriculture in Alaska is the surveying of the public lands. At present no one can get title to farming land in Alaska except by the use of soldiers' additional homestead scrip, and this costs more than the average settler can afford to pay. But when obtained it does not represent more than a small part of the total cost. The settler must at present pay the cost of the survey. This cost is excessive. United States deputy surveyors charge \$15 to \$20 a day, besides traveling expenses and other incidentals. So that by the time one gets title to a farm in Alaska it will have cost him as much as he can buy good improved land for in the States. As long as this condition prevails, Alaska can not be settled and agriculture can not be developed.

COOPERATIVE EXPERIMENTS ON WOOD ISLAND.

I have made an arrangement with the superintendent of the Baptist Orphanage on Wood Island, the reverend Mr. Curtis P. Coe, whereby he will cooperate with the experiment station in carrying out certain experiments. The station is to furnish him with the necessary implements, seeds, and work animals. He will then defray all of the expenses for the work and use land which belongs to the mission. A series of experiments have been planned for next year along the line of the growing of forage and grain crops.

EXPERIMENT STATION IN THE COPPER RIVER COUNTRY.

The information herewith submitted concerning the Copper River country indicates that this extensive region is perhaps the most favorable locality for agriculture in all Alaska. I recommend that a station be established there next summer. To do this, however, means the hiring of a competent assistant, the building of a house and barn, the importation of oxen or horses, and also of farming implements. These are the necessary equipments. The hiring of labor will be additional. At the least calculation all this will cost about \$5,000 for the first year. The transportation of supplies from Valdez to the the interior is very expensive. Last summer it cost 50 cents per pound for transportation of supplies from salt water to Copper Center, 103 miles, and it will cost relatively more for greater distances. If my recommendation meets with approval and a station is established there, we should, of course, own the pack animals and transport the supplies ourselves.

PLANS FOR FUTURE WORK.

During the coming year it is essential that the Rampart Station should be equipped with the necessary implements for work. For that station a team of horses is needed, a wagon, two plows, a disk

harrow, a smoothing harrow, a grain drill, and hand tools of the usual kinds. To lay these things down in Rampart will cost about five times their original value on Puget Sound. In addition, a house and barn should be built, both of logs. There is plenty of timber on the reservation for this purpose. Besides these, the salary of a competent superintendent and at least two laborers during the summer season must be provided for. This meager equipment, including labor for a year, will cost about \$5,000. The work which should occupy these stations will, to begin with, consist mainly in the growing of vegetables and grains in order to establish by actual tests what can be grown there, and the best methods of culture.

At the Sitka and Kenai stations the work already under way should be continued. More land must be cleared in both places and the work extended. As mentioned in the foregoing, a nursery should be established at Sitka, so that we may propagate and distribute hardy fruits to settlers for tests in various parts of the Territory.

It is also of much importance to begin work with the propagation and improvement of several of the native fruits. There are five species of huckleberries, two or three species of cranberries, a crabapple, strawberries, currants, and raspberries, all indigenous to Alaska, and all of which have merits which recommend them for domestication. The native grasses and forage plants also deserve attention, and if the funds permit, work should be undertaken with a view to establish the relative merits of the several species. Grasses of all kinds grow luxuriantly in the coast region wherever they are not driven out by the spruce. The treeless region of western Alaska has an abundant supply of grass, and stock raising is destined to become an important industry in that part of Alaska. And, as shown in this report, there are also large areas of grass land in the interior, where stock can be raised in summer and hay can be made for winter feed.

The improvements which should be made during the coming year include the following:

SITKA STATION.

1. Finishing the headquarters building in accordance with plans.
2. Furnishing a laboratory with the necessary apparatus.
3. Building of two more cottages.
4. Building a small propagating house.
5. The purchase of another yoke of oxen.
6. The purchase of three cows and a bull, as a foundation for a herd.
7. The purchase of additional implements.
8. The establishment of a nursery.
9. Extending the clearing.

KENAI STATION.

1. Extending the clearing.
2. The purchase of additional implements.

RAMPART STATION.

1. The building of a house.
2. The building of a barn.
3. The purchase and importation of a yoke of work oxen or horses.
4. The purchase and importation of the necessary implements.

ESTABLISHMENT OF COPPER RIVER STATION.

1. The selection and survey of a tract of suitable land.
2. Building a house.
3. Building a log barn.
5. The purchase and importation of a yoke of work oxen or horses.
5. The purchase and importation of the necessary implements.

SEVERAL SUBSTATIONS NECESSARY.

The vast extent of territory in Alaska and the great variation in climatic conditions make it necessary that there should be several substations. The places where stations have already been established are believed to be the best that could be selected, and a station somewhere in the Copper River country is equally necessary. I would respectfully call attention to the fact that each of these substations requires a separate equipment and a separate set of men, which multiplies the expense as compared with a single station. It is also to be noted that the equipment of the stations and the cost of labor will amount to anywhere from two to five times what it would cost to equip and work similar stations in the States. The lower rate applies to the coast stations and the higher to the interior stations.

INTRODUCTION OF DEER ON THE WESTERN ISLANDS.

My instructions directed me to ascertain in what manner it might be practicable to introduce deer on Kadiak and adjoining islands. An investigation of the subject was made, and the conclusion is that the most feasible method for the introduction of deer on these islands is to hire Indians to catch the fawns early in the spring, and when a number have been collected, ship them out and turn them loose at some place where they can be looked after and protected from dogs and hunters alike. The fawns can be obtained from almost any of the islands in southeastern Alaska, and the expense connected with the enterprise should not be great. It has been suggested that Wood Island could be made a nursery for deer. The Rev. Mr. Coe has agreed to take the matter in charge there, his mission being located on the island.

The enterprise is proposed as a measure of relief to the natives at Kadiak and elsewhere in that region. There are no deer on these islands, and with the practical extinction of the fur seal and other fur-bearing animals in that region, which have been an important source of income to the natives, they are now at times on the verge of star-

vation, a condition which the introduction of deer would probably ameliorate.

WANTON SLAUGHTER OF GAME.

In this connection I am constrained to mention that in certain parts of Alaska game is destroyed wantonly and in great number. This is the case, for instance, on the Kenai Peninsula. Hunters, not only from this country, but from foreign countries, go there and kill animals, particularly moose and mountain sheep, for the sake of the antlers and heads. I have myself met hunters of this class there every time I have been in the peninsula.

And in southeastern Alaska the Indians kill thousands of deer for the sake of the skins, which they sometimes sell as low as 20 cents apiece, though the average price is more than that. The number of deer skins bought up and exported from nearly every Indian settlement in southeastern Alaska is an index to this kind of wanton slaughter. The remedy would seem to be to prohibit the exportation of the skins and antlers of moose, caribou, mountain sheep, and deer.

WORK AS SPECIAL DISBURSING AGENT.

In order to facilitate the Alaska work, I was appointed a special disbursing agent of the Treasury Department in the summer of 1900. I have in this capacity disbursed the sums which the Treasurer of the United States has from time to time deposited to my credit in Seattle.

SOIL TEMPERATURES.

The tables submitted herewith give the detailed soil temperatures for the places and periods named. The readings are taken from two thermometers, one planted 6 inches deep and the other 24 inches. At stations which are equipped with radiation thermometers the readings of this instrument are also given. It is suspended about 6 inches above the surface of the earth and is not covered. It gives the minimum daily temperature as the vegetation feels it. There appears to be much similarity in the readings for corresponding months at each station, but the period of observation is yet too short to make generalizations.

Soil temperatures.

SITKA EXPERIMENT STATION.

Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mom- eter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mom- eter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mom- eter.
1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.
May 1	42	.....	.....	May 7	40.5	.....	.....	May 13	42.5	.....	.....
May 2	42.5	.....	.....	May 8	41	.....	.....	May 14	42.5	.....	.....
May 3	41	.....	.....	May 9	41	.....	.....	May 15	43	.....	.....
May 4	41	.....	.....	May 10	41	.....	.....	May 16	43	.....	.....
May 5	41	.....	.....	May 11	42.5	.....	.....	May 17	46	.....	.....
May 6	42	.....	.....	May 12	42.5	.....	.....	May 18	46	.....	.....

Soil temperatures—Continued.

SITKA EXPERIMENT STATION—Continued.

Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.
1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.
May 19	45.5	.....	.....	Aug. 4	58	54	51	Oct. 20	41	45	25
May 20	46	.....	.....	Aug. 5	57.5	54	50	Oct. 21	40	45	24
May 21	47	43	.....	Aug. 6	57.5	54	50	Oct. 22	40	45	26
May 22	48	43	.....	Aug. 7	57	54	48	Oct. 23	40	45.5	24
May 23	46.5	43	.....	Aug. 8	57	54.5	48	Oct. 24	40	45.5	24
May 24	45.5	43.5	.....	Aug. 9	56	54	51	Oct. 25	41.5	45	38
May 25	45.5	43	.....	Aug. 10	57	54	45	Oct. 26	42	44	30
May 26	45.5	43.5	.....	Aug. 11	57	54	45	Oct. 27	43	44	38
May 27	45.5	43.5	.....	Aug. 12	56.5	54	49	Oct. 28	43	44	40
May 28	46	43.5	.....	Aug. 13	56	54	46	Oct. 29	41	44	33
May 29	47.5	43.5	.....	Aug. 14	57	54	45	Oct. 30	42	44	34
May 30	47.5	43.5	.....	Aug. 15	57	54	48	Oct. 31	40	44	32
May 31	46.5	43.5	.....	Aug. 16	57	54	53				
June 1	47	44	32	Aug. 17	57	54	51	1900.			
June 2	48	44	32	Aug. 18	57	54	47	May 1	48	44	34
June 3	46.5	44.5	35	Aug. 19	56	54	46	May 2	47	43.5	31
June 4	46.5	44.5	35	Aug. 20	56	54	39	May 3	48	44	43
June 5	46	44.5	35	Aug. 21	55.5	54	40	May 4	47.5	44.5	42
June 6	47	44.5	35	Aug. 22	56	54	46	May 5	44	44.5	27
June 7	47.5	44.5	42	Aug. 23	55.5	54	46	May 6	46	44.5	36
June 8	47	44.5	42	Aug. 24	55	54	41	May 7	44.5	44.5	33
June 9	48	45	46	Aug. 25	55	54	40	May 8	47.5	44.5	39
June 10	48	45	43	Aug. 26	55	54	39	May 9	47	45	36
June 11	48	45	43	Aug. 27	55	54	38	May 10	47.5	45	39
June 12	49	45.5	46	Aug. 28	55	54	38	May 11	47.5	45	30
June 13	50	45.5	46	Aug. 29	55	54	46	May 12	48.5	46	33
June 14	49.5	45.5	44	Aug. 30	55	54	50	May 13	49	46	44
June 15	48.5	46	37	Aug. 31	55	54	45	May 14	49	46.5	41
June 16	49	46	36	Sept. 1	55	54	45	May 15	50	46.5	42
June 17	49	46	36	Sept. 2	54	54	44	May 16	50	46.5	42
June 18	48.5	46	36	Sept. 3	53	53.5	38	May 17	48	47	41
June 19	50	46.5	36	Sept. 4	53	53.5	40	May 18	47	47	36
June 20	50	46.5	44	Sept. 5	53	53.5	42	May 19	47.5	47	36
June 21	50	46.5	39	Sept. 6	53	53	43	May 20	49	47	41
June 22	50	46.5	38	Sept. 7	53	53	38	May 21	47.5	47	32
June 23	50.5	47	39	Sept. 8	53	53	38	May 22	50	47.5	33
June 24	50	47	38	Sept. 9	53	53	38	May 23	48	47.5	30
June 25	50	47.5	40	Sept. 10	53	53	47	May 24	48	47.5	34
June 26	52	47.5	47	Sept. 11	53	53	43	May 25	47.5	47.5	34
June 27	52.5	47.5	46	Sept. 12	53	52.5	46	May 26	50	47.5	39
June 28	52	47.5	45	Sept. 13	52	52.5	52.5	May 27	49	47.5	39
June 29	52	47.5	45	Sept. 14	52	52.5	50	May 28	49	47.5	39
June 30	51	47	44	Sept. 15	52	52.5	50	May 29	48	47.5	40
July 1	51	48	46	Sept. 16	53	52.5	45	May 30	48	47.5	37
July 2	53	48	47	Sept. 17	52	52	48	May 31	45	47.5	34
July 3	52.5	48	41	Sept. 18	52	52	50	June 1	45	47	31
July 4	53	48	48	Sept. 19	52	52	50	June 2	45	46.5	30
July 5	53	48	40	Sept. 20	52	52	50	June 3	48	47	40
July 6	54	48.5	40	Sept. 21	52	52	43	June 4	48	47	41
July 7	54	48.5	49	Sept. 22	50	52	38	June 5	51	47.5	41
July 8	54	48.5	49	Sept. 23	50	51.5	45	June 6	50	47.5	42
July 9	54.5	49	49	Sept. 24	50	51.5	43	June 7	49.5	48.5	40
July 10	55	49	49	Sept. 25	50	51	45	June 8	50	48.5	44
July 11	54.5	49.5	49	Sept. 26	50	51	42	June 9	50	48.5	42
July 12	55	50	49	Sept. 27	50	51	41	June 10	50.5	48.5	42
July 13	55	50	49	Sept. 28	50	51	38	June 11	50.5	48.5	35
July 14	55	50	44	Sept. 29	50	51	42	June 12	50	49	34
July 15	55	50	44	Sept. 30	50	50.5	38	June 13	53	49.5	38
July 16	55.5	50.5	44	Oct. 1	49	50.5	32	June 14	55	50	42
July 17	56	51	50	Oct. 2	49	50.5	45	June 15	55.5	50.5	48
July 18	56	51.5	54	Oct. 3	49	50	38	June 16	55	51	43
July 19	55	51.5	43	Oct. 4	50	50	45	June 17	54.5	50.5	42
July 20	55	51.5	52	Oct. 5	50	50	45	June 18	54.5	51.5	44
July 21	56	51.5	50	Oct. 6	49	50	38	June 19	54.5	51.5	48
July 22	56	51.5	52	Oct. 7	48.5	50	40	June 20	55	51.5	47
July 23	57.5	51.5	51	Oct. 8	47.5	49.5	34	June 21	54.5	51.5	46
July 24	57	52	53	Oct. 9	46	49	30	June 22	52.5	51.5	44
July 25	57	52.5	50	Oct. 10	44	49	30	June 23	54	51.5	46
July 26	57	52.5	49	Oct. 11	43	48.5	25	June 24	55.5	51.5	40
July 27	59	52.5	49	Oct. 12	42.5	48	24	June 25	58.5	52	45
July 28	60	53	51	Oct. 13	43	48	29	June 26	58.5	53	50
July 29	60	53	49	Oct. 14	45	48	40	June 27	58.5	53	44
July 30	60	53.5	50	Oct. 15	46	45.5	39	June 28	58.5	53	42
July 31	61	53.5	50	Oct. 16	46	47	38	June 29	58	53.5	44
Aug. 1	59	54	52	Oct. 17	46	46	38	June 30	60	54	42
Aug. 2	58	54	50	Oct. 18	42.5	45	27	July 1	63	54.5	52
Aug. 3	58.5	54	53	Oct. 19	42	45	28	July 2	59	54.5	50

Soil temperatures—Continued.

SITKA EXPERIMENT STATION—Continued.

Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.
1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.	1901.	°F.	°F.	°F.
July 3	60	54.5	49	Sept. 19	.....	.....	.....	Apr. 6	39	42.5	28
July 4	59.5	54.5	50	Sept. 20	.....	.....	.....	Apr. 7	39	42.5	33
July 5	55.5	54	40	Sept. 21	.....	.....	.....	Apr. 8	39	42.5	36
July 6	57	54	42	Sept. 22	.....	.....	.....	Apr. 9	39	42.5	30
July 7	57.5	54	42	Sept. 23	51	53	33	Apr. 10	39	42.5	31
July 8	59	54.5	46	Sept. 24	51	53	36	Apr. 11	36.5	42	29
July 9	61	55	52	Sept. 25	.....	.....	.....	Apr. 12	36.5	42	29
July 10	58	55	40	Sept. 26	.....	.....	.....	Apr. 13	38.5	41.5	32
July 11	58.5	55	42	Sept. 27	.....	.....	.....	Apr. 14	39.5	41.5	31
July 12	60.5	55	47	Sept. 28	51.5	53	43	Apr. 15	40	42	33
July 13	59	55	50	Sept. 29	50	52	31	Apr. 16	39.5	41	33
July 14	59	55	49	Sept. 30	49	52	36	Apr. 17	39.5	40	33
July 15	58	55	50	Oct. 1	47.5	52	26	Apr. 18	40.5	41	32
July 16	59	55	50	Oct. 2	47	51	33	Apr. 19	42	41.5	38
July 17	57	55	51	Oct. 3	45	50	30	Apr. 20	42	41.5	34
July 18	58	55	50	Oct. 4	44	50	24	Apr. 21	44	42.5	35
July 19	56.5	54.5	51	Oct. 5	44	49	24	Apr. 22	44	43	34
July 20	55	54.5	41	Oct. 6	44.5	49	34	Apr. 23	44.5	43	34
July 21	57	54.5	46	Oct. 7	47	49	42	Apr. 24	45	44	34
July 22	57	54.5	52	Oct. 8	49.5	49	42	Apr. 25	45.5	44.5	36
July 23	57.5	54.5	52	Oct. 9	49	49	39	Apr. 26	45.5	44.5	33
July 24	58	54.5	44	Oct. 10	49	49	38	Apr. 27	46	45	41
July 25	59.5	55	49	Oct. 11	48.5	49.5	38	Apr. 28	46.5	45.5	32
July 26	58	55.5	52	Oct. 12	46.5	49	26	Apr. 29	46.5	45.5	32
July 27	58	55.5	52	Oct. 13	45.5	48	33	Apr. 30	46	45.5	37
July 28	58.5	55.5	44	Oct. 14	46	47.5	37	May 1	42	46	31
July 29	57.5	55.5	49	Oct. 15	46	47.5	33	May 2	40	46	31
July 30	57	55.5	46	Oct. 16	46	48	35	May 3	42	46	33
July 31	57	55	45	Oct. 17	45	48.5	38	May 4	41	45.5	33
Aug. 1	57	55	42	Oct. 18	44.5	48	42	May 5	44	45.5	37
Aug. 2	57.5	55	51	Oct. 19	43	48	33	May 6	45	45.5	42
Aug. 3	58	55	52	Oct. 20	41	47.5	29	May 7	45	46	35
Aug. 4	59	55.5	51	Oct. 21	41	47.5	29	May 8	45	46	31
Aug. 5	58.5	55.5	49	Oct. 22	40.5	46.5	20	May 9	46.5	46	37
Aug. 6	57.5	55.5	45	Oct. 23	40	45	26	May 10	47	46.5	34
Aug. 7	58	55.5	51	Oct. 24	39.5	44.5	33	May 11	46.5	46.5	40
Aug. 8	58.5	55.5	48	Oct. 25	39.5	44.5	33	May 12	44.5	47	37
Aug. 9	60	55.5	49	Oct. 26	39.5	44.5	32	May 13	45	47	36
Aug. 10	60.5	56	54	Oct. 27	39.5	44.5	34	May 14	45.5	47	34
Aug. 11	59	56	44	Oct. 28	39	44.5	32	May 15	46.5	47	41
Aug. 12	57.5	56	42	Oct. 29	39	44	30	May 16	47	47	38
Aug. 13	58	56	50	Oct. 30	39	44	32	May 17	47.5	47.5	40
Aug. 14	56	55.5	49	Oct. 31	39	44	30	May 18	49	47.5	34
Aug. 15	54	55.5	41	Nov. 1	39	41	31	May 19	50	48	35
Aug. 16	57	55	45	Nov. 2	38	43.5	20	May 20	51.5	48	35
Aug. 17	56	55	47	Nov. 3	38	42.5	22	May 21	51	48.5	37
Aug. 18	56.5	55	47	Nov. 4	38	42.5	34	May 22	52	49	40
Aug. 19	57	55	50	Nov. 5	39	42.5	33	May 23	51	49.5	43
Aug. 20	57.5	55	52	Nov. 6	39.5	43	40	May 24	50	50	32
Aug. 21	57.5	55	44	Nov. 7	40.5	43.5	35	May 25	49.5	50	37
Aug. 22	58	55.5	54	Nov. 8	41.5	43.5	31	May 26	48	50	38
Aug. 23	57.5	55.5	53	Nov. 9	42	43.5	34	May 27	48.5	50	38
Aug. 24	56.5	55.5	38	Nov. 10	42	43.5	36	May 28	49	50	33
Aug. 25	56	55	32	Nov. 11	41	43.5	30	May 29	49	50	38
Aug. 26	55	55	40	Nov. 12	38	43	24	May 30	49	50	37
Aug. 27	55	54.5	43	Nov. 13	37	42.5	28	May 31	50	50.5	33
Aug. 28	55	54.5	50	Nov. 14	36	42	25	June 1	50.5	50.5	35
Aug. 29	56	54.5	50	Nov. 15	36	41.5	18	June 2	51	51	39
Aug. 30	56	54.5	47	Nov. 16	.....	.....	.....	June 3	51	51	35
Aug. 31	56	54.5	47	Nov. 17	.....	.....	.....	June 4	50.5	51.5	41
Sept. 1	55.5	54.5	47	Nov. 18	.....	.....	.....	June 5	51.5	51.5	44
Sept. 2	55.5	54.5	47	Nov. 19	.....	.....	.....	June 6	52.5	51.5	40
Sept. 3	55	54.5	39	Nov. 20	.....	.....	.....	June 7	53.5	52	45
Sept. 4	54	54.5	41	Nov. 21	.....	.....	.....	June 8	53	52	45
Sept. 5	54	54.5	40	Nov. 22	.....	.....	.....	June 9	53	52.5	39
Sept. 6	54	54.5	40	Nov. 23	.....	.....	.....	June 10	52	52.5	39
Sept. 7	54	54	39	Nov. 24	.....	.....	.....	June 11	53.5	53.5	45
Sept. 8	54.5	54	49	Nov. 25	.....	.....	.....	June 12	53	52.5	47
Sept. 9	54.5	54	49	Nov. 26	.....	.....	.....	June 13	52	53	43
Sept. 10	55	54	52	Nov. 27	.....	.....	.....	June 14	52.5	53	44
Sept. 11	55.5	54	45	Nov. 28	.....	.....	.....	June 15	53	53	44
Sept. 12	55	54	42	Nov. 29	.....	.....	.....	June 16	54	53	48
Sept. 13	52.5	54	32	Nov. 30	.....	.....	.....	June 17	54.5	53.5	49
Sept. 14	52.5	54	32					June 18	54	53	43
Sept. 15	52	53.5	33	1901.				June 19	54	54	44
Sept. 16	51.5	53	38	Apr. 3	39	42	32	June 20	54	54	45
Sept. 17	53	53	43	Apr. 4	39	42.5	29	June 21	54.5	54	46
Sept. 18	53.5	53	48	Apr. 5	39	42.5	25	June 22	55.5	54.5	49

Soil temperatures—Continued.

SITKA EXPERIMENT STATION—Continued.

Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.
1901.	°F.	°F.	°F.	1901.	°F.	°F.	°F.	1901.	°F.	°F.	°F.
June 23	55	54.5	47	Aug. 7	57.5	59.5	46	Sept. 20	54	57	46
June 24	55	54.5	49	Aug. 8	57.5	59.5	50	Sept. 21	54	57	37
June 25	57	55	48	Aug. 9	56.5	59.5	50	Sept. 22	52.5	57	37
June 26	56.5	55	45	Aug. 10	56.5	59.5	50	Sept. 23	53	57	45
June 27	56.5	55.5	45	Aug. 11	56.5	59.5	51	Sept. 24	53	57	39
June 28	55	55.5	45	Aug. 12	56.5	59.5	50	Sept. 25	53	56.5	37
June 29	54	55.5	46	Aug. 13	56.5	59.5	50	Sept. 26	52	56.5	43
June 30	54.5	55.5	47	Aug. 14	57	59	51	Sept. 27	51.5	56.5	36
July 1	54	55.5	45	Aug. 15	57	59	46	Sept. 28	51	57	36
July 2	55	55.5	45	Aug. 16	57	59	48	Sept. 29	51	56	44
July 3	56.5	55.5	45	Aug. 17	57	59	48	Sept. 30	50	55.5	44
July 4	55.5	55.5	49	Aug. 18	56	59	47	Oct. 1	52	53.5	47
July 5	56.5	56	48	Aug. 19	56	59	50	Oct. 2	52	54	45
July 6	58	56	50	Aug. 20	56	59	49	Oct. 3	52	54	41
July 7	56	56.5	46	Aug. 21	56	59	50	Oct. 4	52	54	45
July 8	55.5	56.5	46	Aug. 22	57	59	52	Oct. 5	52	54	45
July 9	55	56.5	44	Aug. 23	57.5	59	52	Oct. 6	52	54	46
July 10	56.5	56.5	48	Aug. 24	58	59	52	Oct. 7	51.5	54	44
July 11	56.5	56.5	43	Aug. 25	59	59	50	Oct. 8	51.5	53.5	45
July 12	57	56.5	56	Aug. 26	59	59.5	52	Oct. 9	51.5	53.5	43
July 13	57.5	56.5	48	Aug. 27	58.5	59.5	52	Oct. 10	51.5	53	42
July 14	56.5	56.5	48	Aug. 28	57	60	56	Oct. 11	51.5	53	44
July 15	58	57	52	Aug. 29	57	60	54	Oct. 12	51.5	52.5	44
July 16	59.5	57.5	49	Aug. 30	56	59.5	50	Oct. 13	50	52.5	38
July 17	59	58	52	Aug. 31	56	60	57	Oct. 14	48	52.5	31
July 18	58.5	58	45	Sept. 1	55.5	59.5	48	Oct. 15	48	52.5	40
July 19	60	58	51	Sept. 2	55	59.5	48	Oct. 16	49	52	42
July 20	59	58.5	47	Sept. 3	54.5	59	45	Oct. 17	49	52	33
July 21	58.5	58.5	45	Sept. 4	53.5	59	44	Oct. 18	48.5	51.5	44
July 22	60	59	53	Sept. 5	54	58.5	47	Oct. 19	48.5	51.5	45
July 23	59.5	59	49	Sept. 6	54	58.5	50	Oct. 20	48	51	43
July 24	59.5	59	46	Sept. 7	55	58.5	45	Oct. 21	48	51	41
July 25	60	59.5	53	Sept. 8	56	58.5	50	Oct. 22	47	51	40
July 26	60	59.5	52	Sept. 9	57	58.5	48	Oct. 23	46.5	51	38
July 27	60	59.5	49	Sept. 10	57	58.5	49	Oct. 24	46.5	51	31
July 28	60.5	60	50	Sept. 11	57	58.5	50	Oct. 25	46.5	50.5	38
July 29	61.5	60	49	Sept. 12	57	58.5	49	Oct. 26	46	50	41
July 30	62	60	52	Sept. 13	55.5	5.85	44	Oct. 27	46	50	38
Aug. 1	59	60.5	51	Sept. 14	53.5	58.5	45	Oct. 28	45.5	49.5	36
Aug. 2	58	60.5	49	Sept. 15	53	58	44	Oct. 29	44.5	49	36
Aug. 3	58	60.5	50	Sept. 16	53	57.5	48	Oct. 30	44	49	33
Aug. 4	57	60	49	Sept. 17	53.5	57.5	48	Oct. 31	43	49	33
Aug. 5	58	60	50	Sept. 18	54.5	57.5	46				
Aug. 6	58	60	51	Sept. 19	54.5	57.5	50				

KENAI EXPERIMENT STATION.

1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.
May 1	.....	.....	.....	May 28	41	32	.....	June 24	52	42	.....
May 2	.....	.....	.....	May 29	38.5	32	.....	June 25	51.5	42	.....
May 3	.....	.....	.....	May 30	38	32	.....	June 26	53	42.5	.....
May 4	.....	.....	.....	May 31	38.5	32	.....	June 27	52	43.5	.....
May 5	.....	.....	.....	June 1	38	32	.....	June 28	52	44	.....
May 6	.....	.....	.....	June 2	38	32	.....	June 29	51	44	.....
May 7	.....	.....	.....	June 3	39	32	.....	June 30	52	44.5	.....
May 8	.....	.....	.....	June 4	39.5	32	.....	July 1	54	45	.....
May 9	.....	.....	.....	June 5	41	32	.....	July 2	53	45.5	.....
May 10	36	.....	.....	June 6	42	32	.....	July 3	52.5	45.5	.....
May 11	35	.....	.....	June 7	41	32	.....	July 4	52.5	47	.....
May 12	36	.....	.....	June 8	41.5	32	.....	July 5	54	46	.....
May 13	36	.....	.....	June 9	41.5	32	.....	July 6	54.5	46.5	.....
May 14	35	.....	.....	June 10	43	32	.....	July 7	57	47	.....
May 15	36	.....	.....	June 11	42	32	.....	July 8	58	47.5	.....
May 16	36	.....	.....	June 12	45.5	32	.....	July 9	58	48.5	.....
May 17	36.5	.....	.....	June 13	45	32	.....	July 10	58	48.5	.....
May 18	36.5	.....	.....	June 14	44.5	32	.....	July 11	57	49	.....
May 19	36	.....	.....	June 15	45	32.5	.....	July 12	53.5	49	.....
May 20	38	.....	.....	June 16	47	32.5	.....	July 13	52.5	49	.....
May 21	39.5	.....	.....	June 17	48.5	33	.....	July 14	50	49	.....
May 22	39	.....	.....	June 18	48.5	35	.....	July 15	55	49	.....
May 23	39	.....	.....	June 19	48	37.5	.....	July 16	55	49	.....
May 24	39	.....	.....	June 20	47.5	37.5	.....	July 17	59	50	.....
May 25	39	.....	.....	June 21	44.5	39.5	.....	July 18	59	50	.....
May 26	39	.....	.....	June 22	50	40.5	.....	July 19	56	50	.....
May 27	41	.....	.....	June 23	50	41	.....	July 20	56	50	.....

Soil temperatures—Continued.

KENAI EXPERIMENT STATION—Continued.

Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.
1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.	1901.	°F.	°F.	°F.
July 21	57.5	50	.....	Oct. 4	40.5	43.5	.....	Aug. 10	53	51	.....
July 22	57.5	50	.....	Oct. 5	41.5	43.5	.....	Aug. 11	52	51	.....
July 23	58	50.5	.....	Oct. 6	39.5	43	.....	Aug. 12	53.5	51	.....
July 24	55	50	.....	Oct. 7	38.5	43	.....	Aug. 13	54	51	.....
July 25	56	50	.....	Oct. 8	38.5	43	.....	Aug. 14	55.5	50.5	.....
July 26	56	50	.....	Oct. 9	37.5	42.5	.....	Aug. 15	55	50	.....
July 27	57	50	.....	Oct. 10	37.5	42.5	.....	Aug. 16	54	50.5	.....
July 28	58	50.5	.....	Oct. 11	37	42	.....	Aug. 17	54	50.5	.....
July 29	58	50.5	.....	Oct. 12	38.5	41.5	.....	Aug. 18	53	50.5	.....
July 30	59	51.5	.....	Oct. 13	40	41.5	.....	Aug. 19	54	50.5	.....
July 31	59	51.5	.....	Oct. 14	38.5	41.5	.....	Aug. 20	53	50.5	.....
Aug. 1	58.5	52	.....	Oct. 15	39.5	41.5	.....	Aug. 21	53.5	50	.....
Aug. 2	57	52	.....	Oct. 16	39.5	41.5	.....	Aug. 22	54.5	50.5	.....
Aug. 3	56	52	.....	Oct. 17	38.5	41	.....	Aug. 23	54.5	50.5	.....
Aug. 4	55	51.5	.....	Oct. 18	36	41	.....	Aug. 24	54	50.5	.....
Aug. 5	54.5	51.5	.....	Oct. 19	35	40	.....	Aug. 25	54.5	50.5	.....
Aug. 6	54	51.5	.....	Oct. 20	.....	.....	.....	Aug. 26	53.5	50.5	.....
Aug. 7	55	51	.....	Oct. 21	.....	.....	.....	Aug. 27	53	50.5	.....
Aug. 8	55	51	.....	Oct. 22	.....	.....	.....	Aug. 28	53	50.5	.....
Aug. 9	55	51	.....	Oct. 23	.....	.....	.....	Aug. 29	53.5	50	.....
Aug. 10	56	51	.....	Oct. 24	.....	.....	.....	Aug. 30	53.5	50	.....
Aug. 11	55.5	51.5	.....	Oct. 25	.....	.....	.....	Aug. 31	53	50	.....
Aug. 12	54.5	51.5	.....	Oct. 26	.....	.....	.....	Sept. 1	51.5	50	.....
Aug. 13	56	51.5	.....	Oct. 27	.....	.....	.....	Sept. 2	52	50	.....
Aug. 14	54	51.5	.....	Oct. 28	.....	.....	.....	Sept. 3	50.5	49.5	.....
Aug. 15	54	51.5	.....	Oct. 29	.....	.....	.....	Sept. 4	49	49.5	.....
Aug. 16	54	51.5	.....	1901.	.....	.....	.....	Sept. 5	51	49	.....
Aug. 17	53	51.5	.....	June 24	49	.....	.....	Sept. 6	50.5	49	.....
Aug. 18	52.5	51	.....	June 25	49	.....	.....	Sept. 7	50	49	.....
Aug. 19	53	51	.....	June 26	49.5	.....	.....	Sept. 8	51.5	49	.....
Aug. 20	54	51	.....	June 27	51	.....	.....	Sept. 9	48	49	.....
Aug. 21	53	51	.....	June 28	51.5	.....	.....	Sept. 10	49.5	48.5	.....
Aug. 22	51	50.5	.....	June 29	52.5	.....	.....	Sept. 11	51.5	48.5	.....
Aug. 23	53	50.5	.....	June 30	53	.....	.....	Sept. 12	50.5	48.5	.....
Aug. 24	52.5	50.5	.....	July 1	54.5	.....	.....	Sept. 13	51	48.5	.....
Aug. 25	51.5	50.5	.....	July 2	54	.....	.....	Sept. 14	50.5	48.5	.....
Aug. 26	51.5	50	.....	July 3	55	.....	.....	Sept. 15	48	48.5	.....
Aug. 27	52	50	.....	July 4	51	.....	.....	Sept. 16	48	48.5	.....
Aug. 28	52	50	.....	July 5	52	.....	.....	Sept. 17	48	48	.....
Aug. 29	52	50	.....	July 6	51.5	.....	.....	Sept. 18	47.5	47.5	.....
Aug. 30	52	50	.....	July 7	52.5	.....	.....	Sept. 19	48	47.5	.....
Aug. 31	52.5	50	.....	July 8	54.5	.....	.....	Sept. 20	49	47.5	.....
Sept. 1	52.5	50	.....	July 9	53.5	.....	.....	Sept. 21	50	47.5	.....
Sept. 2	51.5	50	.....	July 10	54.5	.....	.....	Sept. 22	49.5	47.5	.....
Sept. 3	51	50	.....	July 11	54.5	.....	.....	Sept. 23	46	47.5	.....
Sept. 4	52	50	.....	July 12	54.5	.....	.....	Sept. 24	46	47	.....
Sept. 5	52	50	.....	July 13	54	.....	.....	Sept. 25	44.5	46.5	.....
Sept. 6	51.5	50	.....	July 14	54	.....	.....	Sept. 26	43	46.5	.....
Sept. 7	51.5	50	.....	July 15	56	.....	.....	Sept. 27	42	46	.....
Sept. 8	51	50	.....	July 16	56	.....	.....	Sept. 28	44	45.5	.....
Sept. 9	52	50	.....	July 17	56	.....	.....	Sept. 29	44	45.5	.....
Sept. 10	51.5	50	.....	July 18	56.5	.....	.....	Sept. 30	43	45	.....
Sept. 11	51	50	.....	July 19	56.5	.....	.....	Oct. 1	41.5	45	.....
Sept. 12	51.5	49	.....	July 20	58	.....	.....	Oct. 2	43.5	44.5	.....
Sept. 13	49	49.5	.....	July 21	58	.....	.....	Oct. 3	45	44.5	.....
Sept. 14	49.5	49.5	.....	July 22	.....	.....	.....	Oct. 4	46	44.5	.....
Sept. 15	49	49	.....	July 23	57.5	.....	.....	Oct. 5	44	44.5	.....
Sept. 16	49.5	49	.....	July 24	57.5	.....	.....	Oct. 6	45	44.5	.....
Sept. 17	49	49	.....	July 25	57	50.5	.....	Oct. 7	44	44.5	.....
Sept. 18	49	48.5	.....	July 26	56.5	50.5	.....	Oct. 8	44	44.5	.....
Sept. 19	45.5	48.5	.....	July 27	57.5	50.5	.....	Oct. 9	44	44.5	.....
Sept. 20	46	48	.....	July 28	58.5	50.5	.....	Oct. 10	43	44	.....
Sept. 21	42.5	47.5	.....	July 29	59	51	.....	Oct. 11	41	44	.....
Sept. 22	42.5	47	.....	July 30	59	51	.....	Oct. 12	41	33.5	.....
Sept. 23	41.5	47	.....	July 31	59	51	.....	Oct. 13	37.5	43	.....
Sept. 24	41	46	.....	Aug. 1	58	51	.....	Oct. 14	39	43	.....
Sept. 25	40	45.5	.....	Aug. 2	58.5	51.5	.....	Oct. 15	40	42.5	.....
Sept. 26	42	45.5	.....	Aug. 3	58.5	51.5	.....	Oct. 16	39	42.5	.....
Sept. 27	43	45	.....	Aug. 4	57	51.5	.....	Oct. 17	37	42	.....
Sept. 28	.....	.....	.....	Aug. 5	56.5	51.5	.....	Oct. 18	36	42	.....
Sept. 29	44	45	.....	Aug. 6	57.5	51.5	.....	Oct. 19	37	41.5	.....
Sept. 30	41	45	.....	Aug. 7	56.5	51.5	.....	Oct. 20	39	41	.....
Oct. 1	39.5	45	.....	Aug. 8	57	52	.....	Oct. 21	39	41	.....
Oct. 2	39	44	.....	Aug. 9	54.5	51.5	.....	Oct. 22	38	41	.....
Oct. 3	39.5	44	.....	.....	.....	.....	.....	Oct. 23	38	41	.....

Soil temperatures—Continued.

EAGLE, ALASKA. U. G. Myers, Observer.

Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.
1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.	1901.	°F.	°F.	°F.
June 1	.....	.....	.....	July 29	56	50.5	48	June 4	40	32.5	30.2
June 2	.....	.....	.....	July 30	53.5	50.5	31	June 5	40.5	32.5	29.3
June 3	.....	.....	.....	July 31	53.5	50.5	29	June 6	42.5	32.5	42.1
June 4	46	48.5	27	Aug. 1	53.5	50.5	29	June 7	40.5	33	31.6
June 5	48	39	31	Aug. 2	54.5	50.5	34	June 8	38	33	26.6
June 6	48.5	39.5	33	Aug. 3	53.5	50.5	32	June 9	40	33	40
June 7	48.5	40.5	29	Aug. 4	55	50.5	46	June 10	40.5	33	30.8
June 8	48	40.5	37	Aug. 5	54	50.5	42	June 11	44	33.5	40
June 9	45	40.5	25	Aug. 6	52	50.5	31	June 12	43	34	32
June 10	47	40.5	32	Aug. 7	52	50	40	June 13	44.5	34.5	33.2
June 11	45	40.5	27	Aug. 8	53.5	50	38	June 14	45	35	40
June 12	46	40.5	40	Aug. 9	54.5	50.5	39	June 15	44	35.5	30
June 13	51	40.5	45	Aug. 10	54	50.5	41	June 16	46.5	36	38
June 14	48.5	40.5	38	Aug. 11	53	50.5	42	June 17	48	37	44.2
June 15	46.5	41.5	34	Aug. 12	50	50.5	28	June 18	48.5	38	37
June 16	49	41.5	38	Aug. 13	52	50	39	June 19	48.5	38.5	45
June 17	49	41.5	33	Aug. 14	50	49.5	45	June 20	51.5	39.5	52
June 18	46	41.5	31	Aug. 15	49	49.5	28	June 21	52	40.5	43.4
June 19	49	41.5	42	Aug. 16	49	49	37	June 22	52.5	41	43.2
June 20	49	41.5	39	Aug. 17	49.5	48.5	34	June 23	52	42	43
June 21	49	42	42	Aug. 18	50.5	48.5	41	June 24	52.5	42.5	35
June 22	49.5	42	40	Aug. 19	48.5	48.5	44	June 25	54	43	46
June 23	49.5	42.5	34	Aug. 20	49	48.5	29	June 26	52	43	33
June 24	51.5	42.5	44	Aug. 21	48.5	48.5	39	June 27	52	43	36
June 25	51.5	43	45	Aug. 22	46	48.5	35	June 28	53	43.5	35
June 26	54	43.5	53	Aug. 23	45	48	29	June 29	55	44	50
June 27	58.5	44	55	Aug. 24	46.5	47.5	26	June 30	52.5	44	47
June 28	58.5	45.5	46	Aug. 25	47.5	47	34	July 1	49	43.5	44.2
June 29	58	47	47	Aug. 26	43	47	39	July 2	50	43	36
June 30	57.5	47.5	40	Aug. 27	42	47	30	July 3	51.5	43	43
July 1	60	48.5	48	Aug. 28	43.5	46	26	July 4	52.5	43	42
July 2	59	49	43	Aug. 29	44	45.5	33	July 5	51.5	43.5	41
July 3	58.5	49	44	Aug. 30	44.5	45.5	39	July 6	52.5	43.5	38.9
July 4	56.5	49	43	Aug. 31	44.5	45	42	July 7	54.5	44	41
July 5	56	49	39					July 8	54.5	44.5	46.4
July 6	55	49	37	1901.				July 9	53.5	45	36
July 7	55.5	49	40	May 13	32	18	.....	July 10	55.5	45	53.5
July 8	55	48.5	42	May 14	32	19	.....	July 11	53.5	45.5	37
July 9	54	48.5	37	May 15	32	18	.....	July 12	53.5	45.5	39
July 10	54	48	42	May 16	32.5	20.5	.....	July 13	54.5	45.5	41
July 11	51	48	38	May 17	33	34.5	.....	July 14	55	46	51
July 12	51.5	47.5	32	May 18	32.5	24.5	.....	July 15	55	46	50.8
July 13	53.5	47.5	36	May 19	33.5	26.3	.....	July 16	55	46	52
July 14	53.5	47.5	35	May 20	34	20	.....	July 17	53	46	49
July 15	54	48.5	35	May 21	35	23.2	.....	July 18	53	46	43
July 16	57	49	46	May 22	36	24.4	.....	July 19	53	46	35
July 17	59	49	35	May 23	39	37	.....	July 20	54.5	46	49.8
July 18	55.5	49.5	37	May 24	36.5	25	.....	July 21	53.5	46	40.5
July 19	53.5	49.5	46	May 25	40.5	37	.....	July 22	53	46.5	37.9
July 20	52.5	49	41	May 26	40	34	.....	July 23	53.5	46.5	33.1
July 21	52	48.5	32	May 27	37.5	35	.....	July 24	54	46.5	33.5
July 22	52	48.5	36	May 28	38	30.4	.....	July 25	54	47	34.1
July 23	52.5	48.5	42	May 29	38.5	30.5	.....	July 26	54	47	37
July 24	56	48.5	47	May 30	38.5	29.5	.....	July 27	54	47	39
July 25	54.5	49	38	May 31	38.5	30	.....	July 28	54	47.5	44
July 26	55.5	49.5	43	June 1	39	32	34	July 29	54	47.5	44.8
July 27	57.5	50	45	June 2	38.5	32	24.5	July 30	52	47.5	41.3
July 28	57.5	50.5	50	June 3	37.5	32	23.3	July 31	52	47.5	35

FORT YUKON. Rev. L. J. H. Wooden, Observer.

1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.
June 1	45	31	37	June 14	43	32	29	June 27	56	36	50
June 2	46	31	42	June 15	43	32	28	June 28	58	37	54
June 3	46	31	47	June 16	43	32	43	June 29	59	37	56
June 4	47	31	44	June 17	45	32	45	June 30	59	38	59
June 5	47	31	46	June 18	46	32	47	July 1	.....	.....	.....
June 6	46	31	45	June 19	47	32	44	July 2	.....	.....	.....
June 7	43	31	41	June 20	47	32	46	July 3	.....	.....	.....
June 8	40	31	36	June 21	46	32	41	July 4	.....	.....	.....
June 9	40	31	41	June 22	47	33	43	July 5	.....	.....	.....
June 10	41	32	36	June 23	51	33	51	July 6	53	40	51
June 11	43	32	42	June 24	51	33	50	July 7	53	41	.....
June 12	45	32	44	June 25	54	34	47	July 8	52	40	40
June 13	46	32	.....	June 26	56	35	55	July 9	53	40	40

Soil temperatures—Continued.

FORT YUKON—Continued.

Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.	Day.	6-inch ther- mome- ter.	24-inch ther- mome- ter.	Radi- ation ther- mome- ter.
1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.
July 10	54	40	44	July 28	55	43	50	Aug. 15	48	41	35
July 11	54	40	43	July 29	54	42	45	Aug. 16	48	41	45
July 12	56	40	40	July 30	55	42	38	Aug. 17	48	41	42
July 13	53	41	46	July 31	56	42	47	Aug. 18	48	40	44
July 14	58	41	46	Aug. 1	56	43	47	Aug. 19	48	40	45
July 15	59	42	56	Aug. 2	57	43	49	Aug. 20	48	40	34
July 16	58	43	49	Aug. 3	56	43	57	Aug. 21	48	40	44
July 17	59	43	.....	Aug. 4	54	43	53	Aug. 22	46	40	38
July 18	53	43	50	Aug. 5	53	43	48	Aug. 23	46	40	31
July 19	54	43	52	Aug. 6	52	43	50	Aug. 24	46	39	32
July 20	54	43	52	Aug. 7	52	43	47	Aug. 25	47	39	42
July 21	53	42	48	Aug. 8	55	42	55	Aug. 26	41	39	28
July 22	55	41	45	Aug. 9	56	42	54	Aug. 27	38	39	23
July 23	56	42	46	Aug. 10	53	43	53	Aug. 28	38	37	31
July 24	55	42	54	Aug. 11	52	42	45	Aug. 29	39	37	34
July 25	55	45	48	Aug. 12	52	42	45	Aug. 30	.....	.....	.....
July 26	56	42	50	Aug. 13	51	42	46	Aug. 31	43	36	31
July 27	56	42	49	Aug. 14	50	42	39				

HOLY CROSS MISSION.

1901.	°F.	°F.	°F.	1901.	°F.	°F.	°F.	1901.	°F.	°F.	°F.
June 6	35	32	35	July 5	46.5	33	38	Aug. 3	51	40	41.5
June 7	37.5	32	36	July 6	45	33.5	34	Aug. 4	50	40	41.5
June 8	37	31.5	38	July 7	47	34	35	Aug. 5	51	40	49.5
June 9	38	31.5	38	July 8	47	34	36	Aug. 6	50	40	50
June 10	40	32	35.5	July 9	48.5	34.5	47.5	Aug. 7	49.5	40	46
June 11	41.5	32	42	July 10	46.5	34.5	45	Aug. 8	45.5	40	32
June 12	40.5	32	37.5	July 11	48	34.5	48	Aug. 9	44	40	37
June 13	42.5	32	37	July 12	49	35	50	Aug. 10	43	39.5	35.5
June 14	44	32	40	July 13	49	35	48	Aug. 11	44	39.5	36
June 15	45.5	32	45.5	July 14	47.5	35.5	45.5	Aug. 12	45	39.5	37.5
June 16	45.5	32	45.5	July 15	47.5	36	40	Aug. 13	45	40	32.5
June 17	44	32	35.5	July 16	48	36	44	Aug. 14	48	40	40
June 18	46	32	44	July 17	49	36.5	44	Aug. 15	47	40	38
June 19	47	32	49	July 18	50	36.5	42	Aug. 16	48	40	37
June 20	50	32	49	July 19	50	36.5	40	Aug. 17	49	40	34
June 21	47.5	32	48	July 20	51	37	41.5	Aug. 18	47	40	32
June 22	49	32	50	July 21	58	38	52	Aug. 19	44	40	40
June 23	46.5	32	41	July 22	57	38.5	50	Aug. 20	47	40	41
June 24	48.5	32	44.5	July 23	56.5	39	48	Aug. 21	48	40	47.5
June 25	44.5	32	45.5	July 24	57	40	53	Aug. 22	48	40	46
June 26	45.5	32	47	July 25	56	40	44	Aug. 23	49.5	40	46
June 27	45	32.5	37.5	July 26	56	40.5	49	Aug. 24	48.5	41	38
June 28	47.5	32.5	44	July 27	52.5	41	47	Aug. 25	46.5	41	40
June 29	44	32	35.5	July 28	50	40.5	47	Aug. 26	46.5	41	40
June 30	43.5	32	37.5	July 29	50	40.5	45	Aug. 27	46	41	37
July 1	44	32.5	36	July 30	49	40.5	39	Aug. 28	45.5	40.5	35
July 2	47.5	32.5	47.5	July 31	49	40	32	Aug. 29	45	40.5	37
July 3	48	33	41	Aug. 1	47	40	30	Aug. 30	43	40	30
July 4	46.5	33	44	Aug. 2	50	40	39.5	Aug. 31	42	40	24

WEATHER SERVICE.

As in the past, I have also, during the period covered by this report, had supervision of the volunteer weather service on the coast, and I submit herewith condensed monthly data from the reports rendered. They indicate for each month the maximum and minimum temperatures, the daily mean temperatures, the total precipitation in inches, and the conditions of the weather as to cloudiness. The temperatures are given in degrees Fahrenheit.

The Chief of the Weather Bureau has informed me that the regular Weather Bureau station at Eagle, which was in charge of a section director of that Bureau, has been discontinued and that the stations in the interior have been directed to send their reports to me in the future.

Meteorological observations.

SITKA. F. E. Rader, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maxim.	Minim.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1899.	°F.	°F.	°F.	Inches.				
May.....	61	29	43	4.01	3	7	21	17
June.....	62	33	48.3	4.99	.....	9	21	16
July.....	87	42	56.5	2.27	6	10	15	8
August.....	67	40	54.5	8.35	4	7	20	14
September.....	68	40	51.1	8.52	4	3	23	19
October.....	62	30	46.3	7.90	3	5	22	17
November.....	57	29	43.5	7.02	2	3	25	14
December.....	50	21	35.4	6.94	7	4	20	11
1900.								
January.....	48	26	36.9	8.71	3	5	23	13
February.....	47	10	33	3.49	9	2	17	13
March.....	65	— 1	37.8	2.62	9	8	14	9
April.....	59	30	41	12.09	5	17	8	22
May.....	69	31	45.4	4.56	6	21	4	19
June.....	71	34	51.8	3.13	9	14	7	13
July.....	69	45	55.4	3.77	2	16	13	16
August.....	67	40	55.2	7.92	2	22	7	19
September.....	65	32	50.9	7.82	4	16	10	14
October.....	58	28	42.5	10.73	3	19	9	20
November.....	57	15	36.4	9.39	8	7	15	14
December.....	52	24	37.4	6.59	.....	9	22	24
1901.								
January.....	48	18	34	9.33	7	3	21	23
February.....	45	13	30.3	6.38	12	6	10	9
March.....	46	17	36.8	7.80	4	12	15	25
April.....	58	27	44.5	7.17	6	12	12	15
May.....	65	31	44.5	4.86	8	13	10	16
June.....	61	36	48.6	1.26	2	11	17	9
July.....	74	35	54.8	.45	8	14	9	6
August.....	63	39	53.7	10.03	.....	5	26	25
September.....	65	39	51.4	8.52	3	12	15	16

KILLISNOO. Jos. Zuboff, Observer.

1899.								
January.....	40	11	29.4	6.41	6	3	22	20
February.....	42	3	26.5	4.80	3	.....	25	20
March.....	44	8	28.6	2	12	6	13	7
April.....	47	27	38.6	1.60	5	3	22	8
May.....	54	26	40.6	1.40	8	3	20	6
June.....	65	37	48.7	3.20	1	9	20	10
July.....	71	44	56.5	.90	10	11	10	4
August.....	68	40	53.9	1.95	4	5	21	13
September.....	59	35	46.8	7.40	4	4	22	19
October.....	52	26	38.5	5.95	4	4	23	22
November.....	49	25	37.8	6.30	1	3	26	24
December.....	40	16	29.2	3.45	6	9	16	15
1900.								
January.....	42	11	31	5.55	3	6	22	17
February.....	42	10	29.9	3.35	9	4	15	12
March.....	50	— 2	32.4	2.40	13	3	15	12
April.....	53	27	40.8	6.85	4	5	21	21
May.....	60	40	46.2	2.20	7	8	16	10
June.....	71	33	50.1	4.30	8	6	16	11
July.....	74	46	57.8	8.45	4	12	15	12
August.....	70	36	54.2	2.30	1	10	20	16
September.....	60	35	48	4.25	5	7	18	18
October.....	54	28	39.5	6	2	5	24	23
November.....	45	10	31.8	7.05	11	2	17	15
December.....	45	20	34.1	6.50	.....	5	26	19
1901.								
January.....	37	13	27	6.95	6	4	21	20
February.....	41	9	23.2	6.05	11	5	12	11
March.....	43	12	34.6	5.40	2	6	23	17
April.....	45	23	36	1.15	2	10	18	7
May.....	61	31	42.8	4	4	10	17	15
June.....	65	34	51.3	1.60	4	14	12	5
July.....	71	43	57.6	1.40	6	14	11	8
August.....	66	40	51.5	5.95	.....	9	22	20
September.....	63	36	49.9	5.50	.....	9	21	17

Meteorological observations—Continued.

JUNEAU. John McLaughlin, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maxi- mum.	Mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1899.	°F.	°F.	°F.	Inches.				
January	44	4	27.4	4.22	11	15	5	17
February	42	4	26	3.81	15	18	.....	13
March	44	10	29.2	1.58	9	9	13	10
April	52	30	40	4.28	6	3	21	19
May	69	29	45	4.68	4	23	4	15
June	68	40	52	5.63	4	8	18	20
July	86	48	62	1.06	18	8	5	7
August	71	42	56	4.88	6	11	14	16
September	66	36	50.3	9.10	5	3	22	23
October	58	26	40.4	11.90	10	6	15	18
November	56	28	40.6	6.71	7	7	16	18
December	48	11	31.4	8.32	13	12	6	16
1900.								
January	40	12	30.6	8.52	11	11	9	20
February	40	10	29	4.09	13	8	7	9
March	61	—5	33.8	3.06	20	7	4	12
April	61	30	41.3	11.37	6	4	20	23
May	64	36	47.2	5	9	10	12	18
June	76	36	53.9	2.27	14	6	10	9
July	77	45	56.2	5.19	7	11	13	12
August	71	39	54.8	6.57	9	4	18	18
September	65	34	50.4	10.84	12	4	14	16
October	55	28	41.5	10.91	10	2	19	20
November	49	10	32.9	12.45	12	6	12	13
December	49	9	32	7.87	3	7	21	25
1901.								
January	40	10	28	9.57	8	3	20	21
February	44	13	26	6.32	16	2	10	8
March	48	16	36	8.23	10	4	17	17
April	55	28	40	8.39	14	3	13	13
May	67	33	46	3.57	10	9	12	17
June	69	39	53.3	1.93	8	10	12	11
July	79	40	57	1.98	15	4	12	12
August	67	45	53.7	14.04	2	2	27	22
September	65	36	49.5	11.41	7	6	17	18

SKAGWAY. George Sexton, Observer.

1899.								
January	40	— 2	22.2	0.94	18	4	9	8
February	44	— 9	19.2	.88	17	3	8	3
March	47	1	23.4	.13	22	3	6	2
April	61	16	41.4	.66	11	18	1	8
May	77.5	25	47.1	1.07	14	11	6	7
June	80	34	54	1.29	10	11	9	11
July	92	41	61.4	.59	19	7	5	3
August								
September	76	30	50	4.68	5	9	16	17
October	53	16	35.7	3.05	10	15	6	10
November	49	24	35.7	2.62	9	6	15	10
December	45	— 1	23.5	1.44	16	4	11	9

SKAGWAY. J. T. Hayne, Observer.

1900.								
January	42	0	17.9	0.86	10	13	8	7
February	41	— 3	23.6	.16	24	2	2	1
March	63	10	29.4	1.00	24	4	3	2
April	58	21	40.4	4.12	10	10	13	13
May	65	30	49	.12	23	6	2	3
June	93	37	58.6	.20	21	8	1	1
July	84	40	59.6	1.70	20	6	5	4
August	75	38	57.9	0	15	15	1	0

Meteorological observations—Continued.

ORCA. Capt. O. J. Humphrey, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maxi-mum.	Mini-mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1899.								
June	77	35	51.1	<i>Inches.</i>	19	1	10	9
July	86	46	61	.....	15	2	14	14
August	78	41	57.1	.....	11	11	7	9
September	74	31	49.2	13.90	.....	.....	.....	.....
October	59	26	38.8	17.87	12	1	18	14
November	48	28	34.4	13.02	4	5	21	16
December	47	10	28.2	9.95	12	3	16	13
1900.								
January	43	10	27.4	9.78	9	0	22	16
February	41	15	30.4	9.93	13	1	14	11
March	57	10	35.9	15.74	16	3	12	10
April	64	25	39.6	16.35	6	2	22	22
May	64	28	43.7	13.70	3	8	20	20
June .....	.....	.....	.....	4.59	13	4	13	11
July .....	.....	.....	.....	5.06	9	9	12	13
August .....	.....	.....	.....	11.25	6	8	17	19
September .....	.....	.....	.....	15.32	11	1	18	14
October (25 days)	53	25	37.8	7.68	10	3	16	17
November	47	14	28.9	4.75	16	3	11	7
December	47	7	29	13.9	10	3	18	15
1901.								
January	40	9	27.1	16.17	13	1	17	16
February	38	8	25	1.21	13	2	13	5
March	50	11	34	16.91	6	2	23	22
April .....	.....	.....	.....	.....	.....	.....	.....	.....
May .....	.....	.....	.....	.....	.....	.....	.....	.....
June .....	.....	.....	.....	.....	.....	.....	.....	.....
July	79	33	53	3.86	11	8	12	9
August	71	41	52.7	27	3	3	28	22
September	74	35	49.6	26.3	10	.....	20	19

FORT LISCUM (VALDEZ). James B. Jackson, Observer.

1900.								
November	50	0	22.4	2.85	.....	.....	.....	6
December	39	— 8	21.6	4.82	.....	.....	.....	9
1901.								
January	41	— 1	23.8	9.4	10	7	14	13
February	41	— 12	15.5	.80	16	8	4	3
March	52	10	30.8	6.38	8	8	15	18
April	50	19	31.6	6.20	13	4	13	12
May	57	27	39.4	1.45	23	1	7	4
June	67	32	49.6	1.13	18	.....	12	10
July	73	32	50.5	4.77	22	.....	9	9
August	63	30	46.6	16.21	2	1	28	28

KENAI. H. P. Nielsen, Observer.

1899.								
May	60	22	41	8.20	8	10	13	9
June	68	31	47.9	6.80	13	8	8	7
July	82	31	54.1	1.36	12	8	10	9
August	66	28	51.9	2.34	10	12	9	15
September	73	17	46.3	4.15	7	9	14	13
October	51	10	34.7	4.32	6	6	19	12
November	44	3	27.2	.32	6	6	18	4
December	41	— 14	13	.67	14	7	10	6
1900.								
January	38	— 26	7.8	1.47	15	8	8	7
February	44	— 10	22.9	.31	10	4	14	4
March	52	— 8	30	.32	15	8	8	3
April	58	10	35.2	.52	8	8	14	11
May	60	21	42.7	.37	7	7	17	6
June	77	30	48.8	.55	5	0	25	4
July	72	33	54.9	.86	6	13	12	5
August	66	29	51.8	3.92	8	7	16	16
September	65	21	46.38	3.34	15	4	11	12
October	54	— 5	32.24	2.19	6	10	15	8

Meteorological observations—Continued.

KENAI. H. P. Nielsen, Observer—Continued.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maxi-mum.	Mini-mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1900.	°F.	°F.	°F.	Inches.				
November	34	-26	13.3	0.90	14	5	11	6
December	42	-32	14.9	1.15	11	3	15	7
1901.								
January	45	-36	11.7	.64	15	3	12	6
February	37	-28	14.2	.07	13	8	7	1
March	50	-21	28.4	.32	6	12	11	7
April	51	10	32.9	.85	14	4	12	6
May	63	23	42.1	.30	18	7	6	2
June	69	29	50.8	.06	13	6	11	1
July	80	30	52.7	1.76	12	4	15	10
August	73	31	52.5	4.75	3	12	16	16
September	62	19	46.5	2.27	13	4	13	14

TYONEK. Thomas W. Hanmore, Observer.

1899.								
January	34	- 8	5.41	1	19	7	5	6
February	38	-12	15.3	.85	17	-----	11	6
March	48	- 4	23.6	.65	22	-----	9	2
April	52	22	37.7	1.43	19	5	6	3
May	60	30	43.1	1.05	13	10	8	5
June	68	34	53.1	1.20	24	1	5	4
July	82	45	58.7	-----	18	3	10	9
August	71	38	56.4	2.72	10	8	13	17
September	70	29	49	5.51	9	11	10	14
October	52	18	35.4	4.02	9	11	11	12
November	44	7	29.2	.58	10	10	10	3
December	41	0	17	.73	20	4	7	3
1900.								
January	35	0	13.4	2.69	15	4	12	6
February	39	1	23.7	.52	14	4	10	6
March	58	1	31.9	.59	17	5	9	5
April	56	11	35.5	.60	9	10	11	6
May	68	33	45.4	.29	12	8	11	5
June	82	40	52.9	.72	23	0	7	6
July	75	40	57	1.05	18	7	6	5
August	73	31	54.6	4.94	10	5	16	17
September	67	32	48.7	4.22	14	7	9	11
October	61	10	36.3	1.87	16	3	12	8
November	34	- 6	16.6	.60	18	4	8	3
December	42	-17	13.9	1.54	15	2	14	7
1901.								
January	38	-19	14.9	1.55	18	3	10	9
February	36	-17	29.3	.20	16	2	10	5
March	46	- 3	33.5	.62	12	5	14	6
April	56	12	33.5	1	19	3	8	5
May	67	22	45.3	.04	25	4	1	1
June	74	33	53.8	.53	15	9	6	7
July	83	38	59	2.68	18	5	8	8
August	62	37	51.7	5.77	5	9	17	17

KADIAK. William J. Fisher, Observer.

1899.								
January	51	- 1	25.3	4.72	10	2	9	16
February	52	5	33.5	4.44	7	3	18	14
March	64	11	36	4.17	18	4	9	11
April	61	23	35.9	3.02	15	2	13	14
May	62	24	44.5	4.97	15	5	11	14
June	76	34	54	2.11	20	2	8	9
July	82	41	59.4	.82	19	3	9	7
August	75	41	58.2	2.37	20	3	8	10
September	59	31	43.3	6.31	13	2	16	19
October	53	23	38.4	5.57	7	0	23	19
December								

Meteorological observations—Continued.

KADIAK AND WOOD ISLAND. Curtis P. Coe, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1900.	°F.	°F.	°F.	Inches.				
January (27 days).....	49	0	28.25	2.95	7	2	18	10
February.....	49	20	35.4	6.19	9	0	19	19
March.....	51	18	37.92	7.46	9	5	17	18
April.....	54	11	37.8	2.60	12	5	12	12
May.....	64	30	44.8	6.62	7	8	16	16
June.....	71	39	51.6	3.35	12	2	16	9
July.....	68	45	54.94	6.64	8	5	18	12
August.....	70	42	56.6	2.74	9	8	14	17
September.....	68	36	50.4	1.95	.....	.....	.....	12
October (25 days).....	63	22	41.9	1.85	4	4	18	9

WOOD ISLAND. Curtis P. Coc, Observer.

1900.								
October.....	63	22	42.2	1.86	4	4	18	9
November.....	54	9	31.9	2.28	14	2	14	5
December.....	49	12	31.7	4.73	11	5	15	9
1901.								
January.....	47	7	30	2.65	11	6	14	9
February.....	58	4	30.6	.30	15	10	3	3
March.....	54	5	34.8	3.85	5	8	18	18
April (16 days).....	55	17	36.4	4.20	10	3	3	8
May.....	63	20	43.2	3.45	15	3	13	16
June.....	73	37	51.2	4.50	15	3	12	11
July.....	79	42	55.3	3.56	14	3	14	8
August.....	70	43	54.6	5.13	4	5	22	19

COAL HARBOR, UNGA ISLAND. H. S. Tibbey, Observer.

1899.								
January.....	45	- 6	26.3	3.30	10	6	15	13
February.....	45	0	31.9	3.77	8	3	17	14
March.....	48	5	34.6	4.04	10	14	7	12
April.....	50	25	35.8	1.82	5	3	22	14
May.....	54	20	39.5	3.72	5	4	22	14
June.....	65	15	40	.39	18	1	11	4
July.....	79	40	54.9	6.21	12	5	14	12
August.....	69	42	54	4.87	5	4	22	10
September.....	66	32	48.7	4.99	5	3	22	11
October.....	58	31	43.6	5.04	7	2	22	18
November.....	49	21	36	1.91	10	0	20	6
December.....	46	5	27.9	.70	5	4	22	4
1900.								
January.....	46	0	28.1	2.69	5	2	24	8
February.....	51	17	35	4.33	3	0	25	16
March.....	53	10	33.4	2.09	11	3	17	8
April.....	47	10	32.3	15.53	1	9	20	19
May.....	57	24	40.7	2.16	2	14	15	8
June.....	69	36	49.5	1.88	1	6	23	6
July.....	69	40	51.6	2.91	5	7	19	17
August.....	69	42	54.2	5.74	0	4	27	16
September.....	64	34	49.4	4.65	3	7	20	13
October.....	60	25	43	5.35	.....	4	27	24
November.....	56	18	36	7.98	4	5	21	19
December.....	47	13	31	3.20	8	3	20	18
1901.								
January.....	47	11	31	4.15	9	5	17	14
February.....	49	- 2	29	6.36	7	3	18	16
March.....	48	7	27.6	1.98	3	6	22	16
April.....	50	12	31.8	3.54	2	7	21	19
May.....	57	22	38.7	.66	8	8	15	9
June.....	61	29	45.3	2.21	10	4	16	14
July.....	69	38	51.9	1.64	8	8	15	8
August.....	68	38	52.2	1.63	2	5	24	18

Meteorological observations—Continued.

ST. MICHAEL. Rev. J. Post, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maxi-mum.	Mini-mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1899.	°F.	°F.	°F.	Inches.				
October	42	13	32.2	0.04	3	13	15	2
November	31	1	17.4	.80	4	8	18	5
December	35	-36	4.4	0	7	7	17	0
1900.								
January	30	-38	- 6.1	.40	18	4	9	2
February	38	-13	16	1	13	5	10	1
March	40	-18	10.4	1	15	3	13	1
April	44	-26	17.6	.40	9	2	19	2
May	54	17	34.7	0	8	6	17	0
June	64	31	44.2	0	10	3	17	0
July	77	40	55.6	(a)	5	5	21	.....
August	65	37	50.2	(a)	2	2	27	.....
September	56	25	43.6	(a)	.....	.....	30	.....
October	53	0	30.4	(a)	3	2	26	.....
November	43	- 9	21	(a)	9	2	19	.....
December	33	-12	11	(a)	8	3	20	.....
1901.								
January	37	-30	- 5.4	(a)	18	1	12	.....
February	38	-27	7	(a)	15	1	12	.....
March	24	-16	3.5	(a)	15	2	14	.....
April	37	-15	11.8	(a)	15	3	12	.....
May	43	- 3	25.2	(a)	13	1	17	.....
June	61	23	40.8	(a)	3	1	26	.....

NOME. N. A. T. & T. Co., Observer.

August (19 days)	59	28	45.4	0.60	9	10	0	3
September	54	22	39	7	11	4	15	17

KOTZEBUE SOUND. Anna M. Foster, Observer.

1898.								
June	72	27	48	(a)	20	(a)	10	(a)
July	81	82	55	(a)	14	(a)	17	(a)
August	64	38	50	(a)	8	(a)	23	(a)
September	50	25	39.4	(a)	12	(a)	13	(a)
October	43	- 5	24.3	(a)	18	(a)	13	(a)
November	19	-23	0	(a)	17	(a)	13	(a)
December	27	-39	7.2	(a)	13	(a)	18	(a)
1899.								
January	17	-31	-10	(a)	17	(a)	14	(a)
February	23	-38	- 9	(a)	20	(a)	8	(a)
March	32	-36	1	(a)	15	(a)	16	(a)
April	40	-24	12	(a)	16	(a)	14	(a)
May	59	- 4	29.3	(a)	13	(a)	17	(a)
June	53	27	37.4	(a)	14	(a)	16	(a)
July	67	34	49.4	(a)	13	(a)	18	(a)
August	63	18	38.6	(a)	16	(a)	15	(a)
September	63	18	38.6	(a)	16	(a)	15	(a)
October	37	- 2	22	(a)	8	(a)	23	(a)
November	22	-17	7	(a)	15	(a)	15	(a)
December	22	-35	- 9	(a)	13	(a)	18	(a)

KOTZEBUE SOUND. Robert Samms, Observer.

1900.								
January	21	-43	-17.1	(a)	20	(a)	11	(a)
February	29	-25	3.3	(a)	19	(a)	9	(a)
March	39	-27	1.2	(a)	20	(a)	11	(a)
April	39	-27	7.6	(a)	17	(a)	13	(a)
May	44	2	28.7	(a)	25	(a)	6	(a)
June	65	27	39.2	(a)	16	(a)	14	(a)
July	71	35	53	(a)	23	(a)	8	(a)

* Not reported.

Meteorological observations—Continued. *

KOTZEBUE SOUND. Robert Samms, Observer—Continued.

Montb.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maxi- mum.	Mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1900.	°F.	°F.	°F.	Inches.				
August.....	66	31	48.8	(a)	15	.....	16	.....
September.....	52	27	39.1	(a)	6	.....	24	.....
October.....	45	-14	22.7	(a)	10	.....	21	.....
November.....	38	-20	9	(a)	15	.....	15	.....
December.....	20	-26	2	(a)	8	.....	23	.....
1901.								
January.....	33	-50	-24.8	(a)	11	.....	20	.....
February.....	34	-45	- 6.5	(a)	14	.....	14	.....
March.....	22	-27	- 5	(a)	28	.....	3	1
April.....	35	-20	8.3	(a)	20	.....	10	.....
May.....	48	.....	22.6	(a)	19	.....	12	.....

EAGLE. U. G. Myers, Section Director.

1899.								
August (16 days).....	76	24	50.1	1.63	2	5	9	8
September.....	66	8	41	.80	3	7	20	7
October.....	41	-19	21	.65	4	9	18	7
November.....	33	-25	1.2	.52	2	4	24	5
December.....	31	-57	-19	.26	15	3	13	6
1900.								
January.....	23	-68	-24.8	.52	14	6	11	7
February.....	18	-51	- 6	.39	11	9	9	5
March.....	56	-46	13	.02	17	8	6	2
April.....	54	-12	29.3	.42	6	13	11	6
May.....	69	20	42.2	.84	9	17	5	7
June.....	87	28	52.6	1.57	8	7	15	13
July.....	81	31	56.9	1.88	12	9	10	13
August.....	79	25	49.1	2.71	2	9	20	16
September.....	68	15	40.4	1.72	4	6	20	14
October.....	44	-17	20.1	1.23	5	10	16	10
November.....	18	-42	-10	.21	9	8	13	5
December.....	32	-52	- 7.4	.77	9	6	16	8
1901.								
January.....	32	-68	-17.8	.42	13	8	10	8
February.....	28	-65	-15.3	.55	15	6	7	4
March.....	42	-49	5	.55	9	8	14	9
April.....	53	-26	19	.56	8	12	10	6
May.....	71	16	39.1	1.63	11	8	12	9
June.....	34	27	52.8	1.22	3	13	14	11
July.....	85	36	57.6	1.47	9	9	13	12

FORT YUKON. L. J. H. Wooden, Observer.

1899.								
September.....	54	9	34.3	0.10	.....	.....	.....	.....
October.....	40	-13	18.7	.45	4	15	12	6
November.....	23	-34	- 1.4	.30	8	12	10	3
December.....	16	-68	-16.1	.47	4	10	17	5
1900.								
January.....	.....	-62	.....	.36	19	5	7	7
February.....	.....	-44	.....	.00	20	8	0	0
March.....	.....	-42	.....	.42	14	10	7	5
April.....	.....	-21	.....	.05	15	9	6	3
May.....	.....	.....	.....	.....	.....	.....	.....	.....
June.....	93	27	58.6	1.19	6	21	3	9
July.....	87	41	64.2	.32	13	15	3	3
August.....	80	23	53.6	1.32	5	9	16	11
September.....	70	19	42.6	.45	5	4	19	8
October.....	48	-17	16.9	.59	5	11	15	11
November.....	22	-43	-10.8	.51	8	13	9	6
December.....	8	-56	-26	.24	5	9	17	5

* Not reported.

Meteorological observations—Continued.

FORT YUKON. L. J. H. Wooden, Observer—Continued.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1901.	°F.	°F.	°F.	Inches.				
January.....		-65		0.55	12	5	13	8
February.....		-53		.03	15	9	4	2
March.....	25	-41	1.6	.38	9	17	5	8
April.....	51	-16	17.4	.56	16	14	.....	5
May.....	66	8	33.2	.46	17	13	1	6
June.....	85	26	58.6	.41	12	18	.....	4

RAMPART. Alvin Liebes, Observer.

1900.								
September (last 6 days).....	49	22	41.2	(a)	1	.....	5	1
October (23 days).....	45	-12	22.7	(a)	2	3	18	.....
November.....	28	-52	- 5.8	(a)	.....	.....	.....	.....
December.....	30	-53	-11.2	(a)	.....	.....	.....	.....
1901.								
January.....	19	-61	-23.4	(a)	.....	.....	.....	.....
February.....	41	-48	-10.3	(b)	.....	.....	.....	.....

HOLY CROSS MISSION. Rev. R. J. Crimont, Observer.

1898.								
November.....	32	-23	1.9	2.48	9	10	11	13
December.....	30	-37	3.4	.....	9	15	7	5
1899.								
January.....	35	-40	- 3.2	5.10	15	6	10	3
February.....	39	-37	- 3.1	1.46	18	5	5	0
March.....	45	16	15.6	1.49	14	9	8	6
April.....	46	0	27.3	1.42	13	9	8	9
May.....	57	13	39.4	.30	18	12	11	8
June.....	74	24	50.6	.....	11	12	7	.....
July.....	82	31	56.9	.....	8	6	17	.....
August.....	70	31	51.5	3.67	0	12	19	14
September.....	62	17	40.9	4.40	2	15	13	19
October.....	44	16	30.3	1.17	4	12	15	15
November.....	23	- 5	10.6	.49	10	18	2	8
December.....	34	-40	- 2.2	.82	16	7	8	9
1900.								
January.....	35	-55	- 9.6	.74	23	4	4	7
February.....	39	-15	14.7	.57	12	8	8	8
March.....	44	-13	15.5	.50	22	4	5	5
April.....	48	-21	24.7	.46	5	15	10	6
May.....	63	18	42.5	.92	5	18	8	11
June.....	74	29	52.4	1.67	16	7	7	7
July.....	77	41	58.8	1.44	12	10	9	15
August.....	64	35	52	5.74	2	10	19	29
September.....	57	25	44.1	6.69	3	15	12	20
October.....	57	-14	27.8	3.34	4	11	16	18
November.....	41	-19	14.4	1.98	12	6	12	7
December.....	35	-24	5.8	4.49	10	9	12	16
1901.								
January.....	30	-45	-11.4	1.46	14	4	13	9
February.....	41	-32	8.3	2.46	9	9	10	11
March.....	37	-28	10	1.06	5	20	6	10
April.....	46	-13	20.6	.55	14	8	8	6
May.....	57	8	35.2	.13	16	12	3	3
June.....	70	29	51.9	.85	7	13	10	10

^a Not reported.^b Rain from evening of 4th to evening of 7th.

